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STATES
COMMISSION,
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# CAMBRIDGE MANUAL TRAINING SCHOOL FOR BOYS

## ✲ 1898 ✲

55.556

The Cambridge Manual Training School for Boys.

"Work is one of our greatest blessings: — Every one should have an honest occupation"

CATALOGUE AND CIRCULAR

OF THE

# Cambridge Manual Training School for Boys

FOUNDER AND SUPPORTER OF THE SCHOOL

FREDERICK H. RINDGE

CAMBRIDGE
LOMBARD AND CAUSTIC PRESS
1898

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# ORGANIZATION.

## Cambridge Manual Training School.

### SUPERVISING COMMITTEE.

EDWIN B. HALE, ESQ., *Chairman.*
ANDREW MCFARLAND DAVIS, A.M., *Secretary.*
COL. THOMAS WENTWORTH HIGGINSON.
ROBERT COWEN, ESQ.
OLIVER H. DURRELL, ESQ.
ERASMUS D. LEAVITT, ESQ.

### OFFICERS AND TEACHERS.

CHARLES H. MORSE, *Superintendent.*

ROBERT C. HARLOW,
Clerk.

ALBERT L. WARE,
Instructor in Drawing.

FREDERICK W. TURNER,
Instructor in Machine-shop Practice.

JAMES G. TELFER,
Instructor in Blacksmithing.

WALLACE B. BLANDIN,
Instructor in Wood-turning and Pattern-making.

WALTER M. SMITH,
Instructor in Iron-fitting.

FREDERICK B. SCOTTON,
Instructor in Drawing.

FREDERICK A. HUNNEWELL,
Instructor in Carpentry and Joinery.

SIDNEY I. B. STODDER,
Engineer.

FREDERIC W. TAYLOR, M.D.,
Physical Examiner and Lecturer upon "First Aid to the Injured."

ALBERT P. BRIGGS,
Instructor in Singing.
ALBERT R. MACKUSICK,
Band Master.

## Cambridge English High School.

### COMMITTEE ON HIGH SCHOOLS.

PROF. FRANK W. TAUSSIG, *Chairman.*
EDWARD B. MALLEY, ESQ.
GEORGE P. JOHNSON, ESQ.
MRS. CAROLINE L. EDGERLY.
FRANK C. CHAMBERLAIN, ESQ.

### OFFICERS AND TEACHERS.

(Connected with the Academic work of the Manual Training School.)

RAY GREENE HULING, D.Sc., *Head Master,*
History.
CHARLES F. WARNER, A.M., *Master,*
Physics, Geometry.
MYRA I. ELLIS,
Algebra, English.
LOUISA P. PARKER,
English, History, Civics.

GRACE L. DEERING,
History, German, English.
MARIA E. SPARE,
French.
DELIA M. STICKNEY, B. S.,
Chemistry.
EMMA A. SCUDDER,
Botany.
JOSEPH A. COOLIDGE, A. M.,
Advanced Algebra.
LILLIAN C. ROGERS, A. B.,
French.
MARTHA R. SMITH,
Geometry.
ESTHER S. DODGE, A. B.,
English, History.

# OUTLINE

OF THE

# COURSE OF INSTRUCTION.

## First Year. Class IV.

| English High School. | Hours per Week. | Months. | Manual Training School. | Hours per Week. | Months. |
|---|---|---|---|---|---|
| Elementary Algebra... | 5 | 10 | Drawing ..... | 5 | 10 |
| English History..... | 3 | 7 | Carpentry and Joinery, | 10 | 5 |
| Civics. ..... | 3 | 3 | Iron-fitting ..... | 10 | 5 |
| English Language } .. " Literature } | 2 | 10 | | | |

## Second Year. Class III.

| | | | | | |
|---|---|---|---|---|---|
| Geometry ..... | 3 | 10 | Drawing ..... | 5 | 10 |
| Physics ..... | 5 | 10 | Wood-turning and } .. Pattern-making } | 10 | 5 |
| English Language } .. " Literature } | 2 | 10 | Blacksmithing } .... Casting } | 10 | 5 |

## Third Year. Class II.

| | | | | | |
|---|---|---|---|---|---|
| 1. { Advanced Algebra, | 5 | 6 | | | |
| 1. { Geometry ..... | 5 | 4 | Drawing (alternate | | |
| 2. { Physics ..... | 2 | 10 | days) ..... | 10 | 5 |
| 2. { Chemistry..... | 3 | 10 | Machine shop (alter- | | |
| French ..... | 5 | 10 | nate days)..... | 10 | 5 |
| English Language } .. " Literature } | 3 | 10 | | | |

An option is offered between Nos. 1 and 2.

## Fourth Year. Class I.

| | | | | | |
|---|---|---|---|---|---|
| 1. { Solid Geometry } { Reviews in Math. } | 5 | 10 | Drawing (alternate | | |
| 2. { Chemistry } { Botany } ..... | 5 | 10 | days) ..... | 10 | 5 |
| English Language } " Literature } .. U.S. History..... } | 3 | 10 | Machine-shop (alter- nate days)..... | 10 | 5 |
| French ..... | 5 | 10 | | | |

An option is offered between Nos. 1 and 2.

# REQUIREMENTS FOR ADMISSION.

The Cambridge Manual Training School is open to all persons regularly admitted to the English High School, who elect the Manual Training course of study. The qualifications for admission to this school are: "Ability to read, write, spell, and define well; a good knowledge of English grammar; a general knowledge of the history of the United States; a thorough acquaintance with geography and arithmetic, and, in general, with all the studies required in the lower schools.

**Qualifications for Admission.**

"Pupils who have received the diploma of their respective grammar schools, certifying that they have completed the prescribed course of study, may be admitted to the English High School without an examination. For other persons who desire admission, an examination shall be held at the beginning of the autumn term, under the direction of the Committee on High Schools; but pupils may be admitted to advanced standing at any time. No pupil from any class in a grammar school shall be examined who does not present a satisfactory certificate that he has pursued his studies during the summer vacation."

**Admission on Diploma.**

In order to provide adequately for the future needs of the youth of Cambridge, for whose benefit the Manual Training School was primarily established, it has been equipped on a scale of liberality which makes it possible to accommodate, for the present, a considerable number of non-resident pupils.

**Admission of Non-residents.**

**Tuition.**

The tuition is free to the sons of all persons who have been citizens of Cambridge for two years; all others will be charged at the rate of one hundred fifty ($150) dollars per annum, a sum which barely covers the cost of instruction and materials. Tuition is payable in advance; the first half ($75) is due upon entrance to the school, the second half is due the 15th of February immediately succeeding.

**Charge for Incidentals.**

Necessary incidentals, including drill suit, locker, and toilet articles, cost from $3 to $8. There are no other charges.

**Cost of Board.**

Good board, with comfortably furnished rooms, can be obtained within a moderate distance from the school, at rates varying from $5 to $12 per week

**School not Dependent on Tuition.**

In order to avoid misunderstanding, it seems proper to state that the school is in no sense dependent upon the tuition of pupils for its support. The liberality of its founder makes it possible to place the work upon a high plane of excellence in every respect, and the decision to admit such non-resident pupils as the school can now accommodate has been made in response to numerous requests and for the sole purpose of extending its usefulness.

Correspondence should be addressed to

CHARLES H. MORSE, *Superintendent*,
*Cambridge Manual Training School*,
*Cambridge*, *Mass.*

# REGISTER OF GRADUATES.

## 1891.

| | First Occupation after Graduation. | Present Occupation. |
|---|---|---|
| H. H. Batchelder | With City Engineer, Cambridge. | Same. |
| W. H. Copithorne | Draughtsman, American Bell Telephone Co. | Same. |
| Arthur D. Dean | Student, M.I.T. | Supt. Manual Training School, Malden, Mass. |
| Joseph J. Eaton | Student, L.S.S. | Asst. Supt. Manual Training School, Fitchburg, Mass. |
| S. P. Gibson | Stenographer. | Same. |
| George F. Kenney | Machinist, Seelye Mfg. Co. | Salesman, Seelye Mfg. Co. |
| W. L. Littlefield | Student, U. S. Naval Academy, Annapolis. | Naval Officer, U.S.N., U.S.S. "Massachusetts." |
| John N. Lounsbury | Draughtsman, Geo. F. Blake Mfg. Co. | Rubber goods, Chicago, Ill. |
| Henry J. McCue | Mechanical Draughtsman. | Architectural Draughtsman. |
| Thomas J. O'Keefe | With Ingalls & Kendricken Steam-heating Engineers. | Same. |
| A. W. Quinn | Manufacturer of Leather Dressing. | Same. |
| F. S. V. Sias | Student, M.I.T. | Eastern Manager National Conduit and Cable Co., New York. |
| P. C. Smith | Engraver. | Same. |

## 1892.

| | | |
|---|---|---|
| Gannett F. Allen | Electrotype finisher. | Same. |
| Chas. Altmiller | Draughtsman, Boston Bridge Works. | Draughtsman, Elmira Bridge Co. |
| Edwin F. Barbour | Draughtsman and Electric Wireman. | Electrical Machinist General Electric Co., San Francisco, Cal. |
| Frederick K. Clark. | Clerk, D. M. Hazen & Sons. | Salesman, Chase & Sanborn. |
| John Crawford, Jr. | Clerk, Rogers, Brown & Co. "Pig Iron." | Manager Shoe Dept., Rogers, Peet & Co., N. Y. |
| Edwin G. Davis | Draughting, Blake Pump Works. | Student, L.S.S. |
| Proctor L. Dougherty | Student, M.I.T. | Electrical Engineer. |
| Edwin R. Fairchild | Electrical Construction, H. S. Slade & Co. | Harvard Library. |

| | First Occupation after Graduation. | Present Occupation. |
|---|---|---|
| George L. Fiske | Asst. Electrician, Camb. El. Lt. Co. | Inspector, New Eng. Tel. & Tel. Co. |
| J. Arthur Gass | Produce Dealer. | With Gass, Doe & Co. |
| Fred A. Hunnewell | Student, M.I.T. | Instructor in Carpentry and Joinery C.M.T S. |
| Fred W. Jouett | Clerk, Cobb, Bates & Yerxa | Wholesale Lumber. |
| George C. Lewis | Photographer's Assistant. | Porter, Wagner Palace Car Co. |
| F. A. Lincoln | Clerk, wholesale dry goods. | Same. |
| George R. Moore | Draughtsman. | Broker. |
| George E. Muzzey | Clerk, Purchasing Agent, F. R. R. | Furniture Dealer. |
| William E. Ricker | Clerk, Wholesale Groceries. | Clerk, Retail Groceries. |
| Irwin G. Ritchie | With Damon Safe Works. | Same. |
| Edward Ruggli | Clerk, wholesale paint and oil. | News Dept. Amee Bros. |
| Frederick B. Scotton | Instructor in Drawing, C. M.T.S. | Same. |
| Charles B. Stebbins | Student, M.I.T. | Draughtsman, Marblehead Yacht Yard. |
| Chester F. Stiles | Student, L.S.S., | Andrew J. Lloyd & Co. Opticians. |
| Charles L. Taylor | Purchasing Agent, Boston Woven Hose Co. | Same. |
| Henry E. Wade | Lumber Surveyor. | Asst. to Auditor, Harvard Dining Association. |
| Thomas Wiseman | Road Dept., Boston & Albany R. R. | Machinist. |
| George J. Zittel | Clerk, Union Pacific R. R. | Clerk, Boston Packing and Provision Co. |

## 1893.

| | | |
|---|---|---|
| G. E. Allyn | Student, L.S.S. | Camb. Gas. Lt. Co. |
| Percy I. Balch | Architecture. | Same. |
| Harrington Barker | Student, M.I.T. | Same. |
| John C. Billings | Teacher, Waltham Manual Training School. | Same. |
| Frank S. Breen | Clerk, Post-office, Arlington, Mass. | Chief Clerk, Post-office, Arlington, Mass. |
| Lewis R. Brine | Student, L.S.S. | Same. |
| W. H. Brockbank | Draughtsman, Boston Bridge Works. | Draughtsman, Norton Iron Co., Everett. |
| Elmer Burgess | Cracker Merchant. | Same. |
| Edward L. C. Clark | Student, L.S.S. | Same. |
| Thomas W. Clark | Student, L.S.S. | Same. |
| E. S. Ensign | | |
| W. B. Fitch | Clerk. | Same. |
| Heber A. Hopkins | Student, M.I.T. | Same. |
| Arthur Jewell | Blacksmith, C.M.T.S. | Asst. to Cambridge Inspector of Wires. |
| Charles W. Kohler | Draughting. | Machinist. |

| | Occupation after Graduation. | Present Occupation. |
|---|---|---|
| Louis Levit | Student, Commercial College. | Book-keeper. |
| J. J. McCarthy | Entry Clerk. | Same. |
| George N. Morse | Draughtsman, Curtis Davis & Co., Cambridge. | Same. |
| Roy S. Nason | Asst. to City Engineer, Cambridge. | Surveyor, Venezuela, South America. |
| William W. Parker | Asst. to City Engineer, Everett, Mass. | Inspector, Everett Sewer Department. |
| Webster T. Rich | Experimental Work, L.S.S. | Clerk, Wholesale Hardware, Denver, Col. |
| Ralph P. Russell | Clerk, Mason & Hamlin Piano Co. | Same. |
| Morton C. Seelye | Shoe Machinery. | Same. |
| W. Frank Smith | Student, M.I.T. | Supt. Manual Training School, Lewiston, Me. |
| Harry I. Tinkham | At Cambridge Public Library. | Pianoforte Tuner. |
| George W. Wells | Asst. Clerk, C.M.T.S. | Electrician, Mechanics Building, Boston. |
| Herbert E. Wilson | Printer. | Same. |
| John W. Wood, Jr. | Student, L.S.S. | Same. |

## 1894.

| | | |
|---|---|---|
| John Anderson | Architectural Draughtsman. | Same. |
| Eric W. Bailey | Student, M.I.T. | Same. |
| William A. Bradford | Draughtsman. | Machinist, Angier Chemical Co. |
| William G. Burns | Chair Manufacturer. | With Mass. Highway Commission. |
| J. H. Eldridge | | |
| Walter G. Higgins | Clerk. | Same. |
| Clarence P. Kidder | Clerk. | Same. |
| L. P. McDermott | Clerk. | Plumber. |
| Fred'k M. McIntire | Student, L.S.S. | Same. |
| Edwin J. Mace.* | | |
| Harry L. Marshall | Clerk, Lechmere National Bank. | Same. |
| John F. Marshall | Student, L.S.S. | Same. |
| H. S. Moody | Civil Engineering. | Railway Construction. |
| James Murray | Clerk. | Same. |
| H. C. Packard | Rodman, Hodges & Harrington, Civil Eng. | Railway Construction. |
| Fred L. Pancoast | Instructor in Iron-fitting, C.M.T.S. | Machinist, Boston Die Co. |
| William H. Varnum | Draughting, Monuments, etc. | Student, Normal Art School. |
| William H. Walker | Draughtsman, American Bell Tel. Co. | Same. |

* Deceased.

| | First Occupation after Graduation. | Present Occupation. |
|---|---|---|
| Charles B. Wendell | Assistant to Middlesex County Engineer. | Same. |
| Herbert F. Winn | Student, College of Pharmacy. | Same |

## 1895.

| | | |
|---|---|---|
| Charles F. Borland | With American Fire Extinguisher Co. | Law School, B. U. |
| Walter G. Burns | Clerk, Curtis Davis Soap Co. | Same. |
| Fred W. Chipman | Student, C.M.T.S. (special course) | Draughtsman, Sturtevant Blower Co. |
| Herbert L. Crane | Mass. Fan Co. | Same. |
| E. T. Dakin | Draughtsman | Same. |
| Walter E. Doherty | Custom House Broker. | Same. |
| Jeremiah F. Downey | Student, L.S.S. | Machinist, North Packing Co. |
| Harry F. Grant | With Speare's Cycle Mfg. Co., Worcester, Mass. | Grocer. |
| Thomas Hadley | Clerk, John C. Dow & Co. | Clerk, Wholesale Leather. |
| L. G. Hathaway | Student, Commercial College. | Baker. |
| William B. Hewitt | Janitor, Willard School | Draughtsman. |
| Benj. Howe | Ticket Auditor's Office, B. & A. R. R. | Same. |
| Frank B. Lake | Student, L.S.S. | Same. |
| Clifford F. Lerned | Butter, Cheese and Eggs. | Same. |
| W. H. Lochman | Student, English High School. | With Boston Woven Hose Co., Western Dept. |
| George Lucy | Clerk | Same. |
| William B. Moore | Clerk, Wholesale Tailors' Trimmings. | Same. |
| Arthur W. Olive | Bank Clerk. | Same. |
| George C. Perkins | Clerk, Brown, Durrell & Co., Wholesale Small Wares. | Same. |
| J. Alfred Ritchie | Wakefield Rattan Works. | Same. |
| Samuel D. Tucker | Mechanical Draughtsman. | Same. |
| William H. White | Asst. to Instructor in Iron-fitting, C.M.T.S. | Shipper, Boston Molasses Co. |
| Fred W. Woolway | Asst. Bookkeeper. | Asst. English High School Laboratory. |
| H. F. Wyeth | Clerk, Dry Goods Commission. | Same. |

## 1896.

| | | |
|---|---|---|
| George H. Bunton | Student, L.S.S. | Same. |
| Arthur A. Coburn | Student, Business College. | |
| Joseph S. Croswell | Draughtsman. | Student, L.S.S. |
| M. Davenport | Student, M.I.T. | Same. |

| | First Occupation after Graduation | Present Occupation. |
|---|---|---|
| August G. Gutheim | General Auditor's Office, F R.R. | Same. |
| Albert Harris | Student, L.S.S. | Same. |
| J. Joseph Hill | Bank Clerk. | Same. |
| Charles W. Hodsdon | Student, M.I.T. | Same. |
| Meredith H. MacKusick, | Chemical Lab. Boston Woven Hose Co. | Same. |
| Ralph S. Moore | Student, L.S.S. | Same. |
| L. Warren | Student, L.S.S. | Same. |

## 1897.

| | | |
|---|---|---|
| Charles M. Abbott | Machinist, Watertown Arsenal. | Same. |
| Edmund L. Brown | Machinist, U. S. F. & P. Telegraph Co. | Same. |
| Charles W. Cade | Student, M.I.T. | Same. |
| Edward P. Fleming | Student, M.I.T. | Same. |
| Olmore C. Francis | Real Estate. | Same. |
| Royal H. Frost | Asst. Harvard University Observatory. | Same. |
| Ernest O. Garrett | Hardware. | Same. |
| William J. Greene. | Machinist, Boston Electric Co. | Same. |
| Charles A. Haley | Salesman, Brown, Durrell & Co. | Same. |
| Homer V. Hall | With Reversible Collar Co., Cambridge. | Same. |
| Henry N. Hudson | Student, M.I.T. | Same. |
| James L Jones | Draughting, Denver, Colorado. | Same. |
| Alfred R. Lincoln | Post-Graduate Course. | Same. |
| Charles McCue | | Same. |
| Frederick Pope | Student, L.S.S. | |
| John H. Robinson | Chemical Laboratory, H. J. Williams, Boston. | Same. |
| George A. Sawin | Student, L.S.S. | Same. |
| John W. Trefry | Salesman, Farley, Harvey & Co. | Same. |
| John M. Whitaker | Taber & Mayer, Telephones, Boston. | Same. |
| Wm. Thorning Wood | Machinist, Lynn Electric Co. | Same. |

# THE CAMBRIDGE MANUAL TRAINING SCHOOL ASSOCIATION.

| | |
|---|---|
| Frederick W. Hunnewell, '92 | *President.* |
| Charles F. Borland, '95 | *Vice-President.* |
| Proctor L. Dougherty, '92 | *Secretary.* |
| William E. Ricker, '92 | *Treasurer.* |

# STATISTICS OF MEMBERSHIP.

## 1889–1890.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools | 43 |
| " " " " other schools | 6 |
| Total No. entered | 49 |
| No. previously entered | 47 |
| Total No. entered to date | 96 |

## 1890–1891.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools | 53 |
| " " " " other schools | 13 |
| Total No. entered | 66 |
| No. previously entered | 96 |
| Total No. entered to date | 162 |

| | Three years' course. |
|---|---|
| No. of pupils graduated . . . . | 13 |

## 1891–1892.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools . | 49 |
| " " " " other schools . . . . | 13 |
| Total No. entered . . . . . | 72 |
| No. previously entered . . . . . | 162 |
| Total No. entered to date . . . . . | 234 |

| | Three years' course. |
|---|---|
| No. of pupils graduated . . . . | 25 |
| " " previously graduated . . | 13 |
| Total No. graduated . . . | 38 |

## 1892–1893.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools . | 71 |
| " " " " other schools . . . . | 9 |
| Total No. entered . . . . . | 80 |
| No. previously entered . . . . . | 234 |
| Total No. entered to date . . . . | 314 |

| | Three years' course. | Four years' course. |
|---|---|---|
| No. of pupils graduated . . . | 26 | 6 |
| " " previously graduated . | 38 | — |
| Total No. graduated to date . | 64 | 6 |

### 1893–1894.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools | 62 |
| " " " " other schools | 21 |
| Total No. entered | 83 |
| No. of pupils previously entered | 314 |
| Total No. entered to date | 397 |

| | Three years' course. | Four years' course. |
|---|---|---|
| No. of pupils graduated | 22 | 4 |
| " " previously graduated | 64 | 6 |
| Total No. graduated to date | 86 | 10 |

### 1894–1895.

| | |
|---|---|
| No. of pupils entered from Cambridge grammar schools | 54 |
| " " " " other schools | 22 |
| Total No. entered | 76 |
| No. previously entered | 397 |
| Total No. entered to date | 473 |

| | Three years' course. | Four years' course. |
|---|---|---|
| No. of pupils graduated | 34 | 1 |
| " " previously graduated | 86 | 10 |
| Total No. graduated to date | 120 | 11 |

At the opening of the school in September, 1895, the course of study was changed from one giving an option between three and four years to one of four years only.

### 1895–1896.

| | | |
|---|---|---|
| No. of pupils entered from Cambridge grammar schools | | 58 |
| " " " " other schools | | 18 |
| Total No. entered | | 76 |
| No. of pupils previously entered | | 473 |
| Total No. entered to date | | 549 |
| No. of pupils graduated | 10 | |
| " " previously graduated | 131 | |
| Total No. graduated to date | 141 | |

### 1896–1897.

| | | |
|---|---|---|
| No. of pupils entered from Cambridge grammar schools | | 51 |
| " " " " other schools | | 22 |
| Total No. entered | | 73 |
| No. of pupils previously entered | | 549 |
| Total No. entered to date | | 622 |
| No. of pupils graduated | 20 | |
| " " previously graduated | 141 | |
| Total No. graduated to date | 161 | |

Cambridge Public Library.

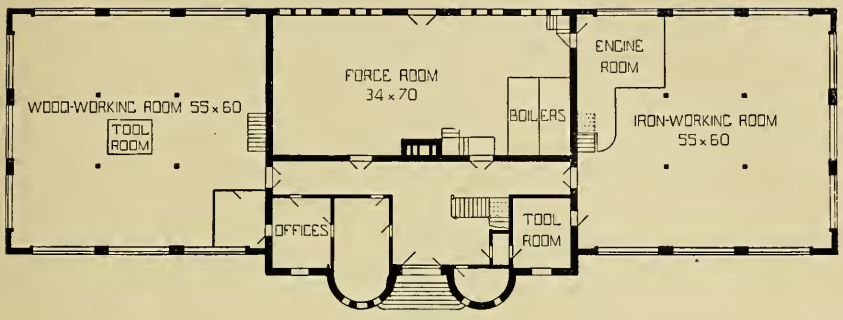
Cambridge English High School.

Neighboring Educational Buildings.

# CIRCULAR OF INFORMATION.

## HISTORY OF THE SCHOOL.

The Cambridge Manual Training School for Boys was founded and is maintained by Mr. Frederick H. Rindge. The purpose of the founder was to establish a school in which boys of average talents and of strong physique should receive instruction in the manual arts, should learn the lessons of faithful industry and wise economy, should become accustomed to being under authority, and should acquire habits which conduce to the maintenance of health and to nobility of character. To carry this purpose into effect a supervising committee was appointed to take charge of the erection and furnishing of necessary buildings, and of the organization and work of the school. As an essential part of the plan adopted for its management it was brought into such relations to the English High School of the city that the academic instruction to be given to those boys who were to receive its special training should be in part the same as that given in the High School, and should be given by the teachers of that school. It was accordingly made a rule of admission to its privileges that pupils entering the High School and electing to take the work of the Manual Training School might take special studies in the former instead of its full course, and that the manual training work should take the place of the other studies comprised in that course. Under this arrangement students in the Manual Training School are also enrolled as pupils in the High School. The relation of the Manual Training to the English High School was further fixed by putting the distinctive work of each under the direction of its own special supervising committee. The instructors in the various lines of mechanical training, in accordance with this arrangement, were and are selected by



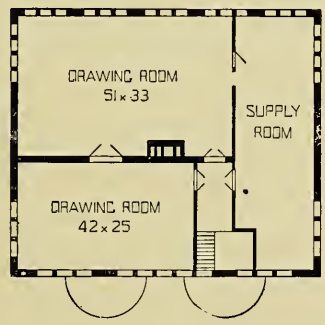




Fig. 3. — Floor Plans of the Mechanical Building.

and responsible to the Supervising Committee of the Manual Training School, while those of the English High School are selected by and responsible to the City School Board.

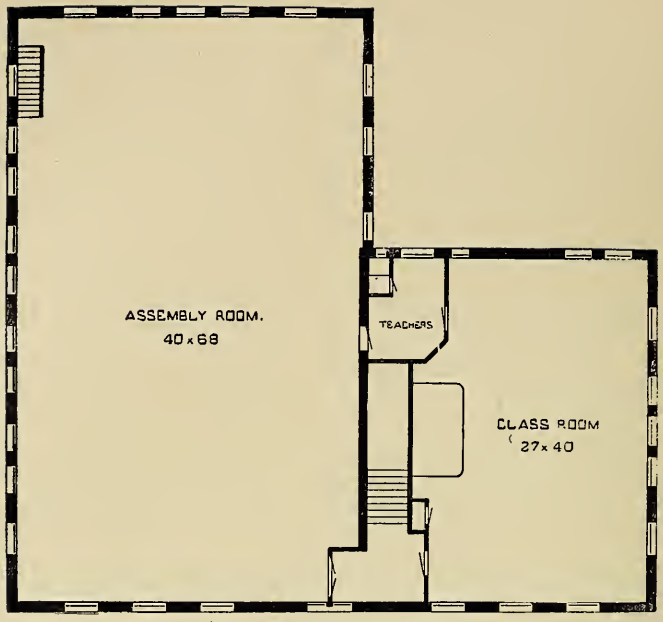
The Manual Training School entered upon its work at the beginning of the school year 1888–89. It was especially fortunate in having at its head as superintendent the late Harry Ellis, who brought to his work those qualifications of head and heart peculiarly adapted to insure its success from the start. Its first class was one of fifteen members, who were graduated in June, 1891.

## BUILDINGS.

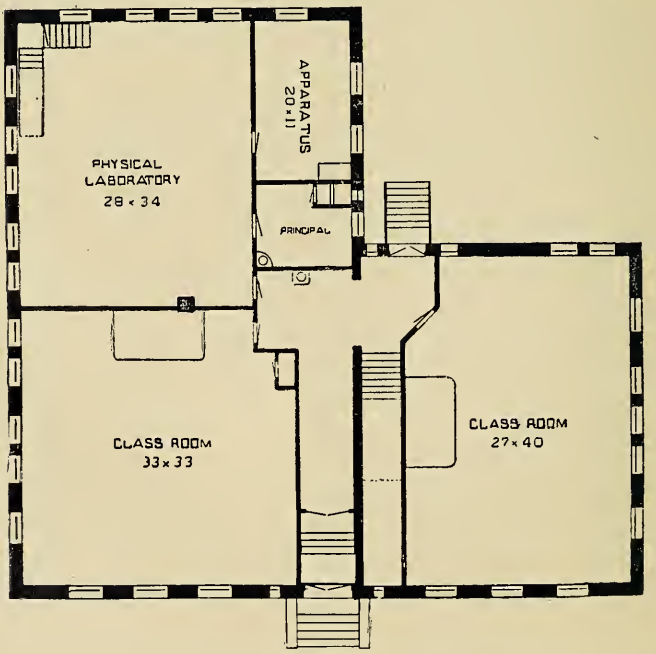
There are two buildings occupied by the school. One, the larger of the two, is devoted to the manual work of the course, and the other to the academic. The former was erected for and occupied by the school in 1888; the latter was erected later and was first occupied in the spring of 1893. Both in their plan and equipment embody the results of careful study of all available information in regard to similar institutions in this country and abroad, and each is admirably fitted for its special use. Their general appearance, relative location, and arrangement are shown in the frontispiece, in Fig. 4, and in accompanying plans.

The building devoted to manual training proper appears in the foreground of the frontispiece. The south wing of this building as shown in the floor plans (Fig. 3) contains the room devoted to the two departments of wood-working; the north wing, that devoted to the two departments of iron-working. These rooms are each 55 × 60 feet and are well lighted. In the main part of the building are the offices, a tool-room, a forge-room 34 × 70 feet, and the boiler-room. The second story of this main part contains rooms for drawing and for storage. In the basement are lockers for the clothing of the pupils, wash-rooms containing large sinks supplied with hot and cold water, a janitor's room, a battery room, the ordinary toilet-rooms, and in the southern wing a spacious lunch-room in which are served hot lunches prepared in a well-fitted kitchen adjoining. These lunches are furnished to pupils and teachers at moderate cost.

Fig. 4. — The Academic Building — Cambridge Manual Training School.




S cond Floor.




First Floor.

Fig. 5. — Floor Plans of the Academic Building.

The building devoted to academic work, shown in Figs. 4 and 5, contains an assembly hall having a seating capacity of 300, three well-appointed school-rooms, a physical laboratory fitted with the latest appliances for the teaching of physics by modern methods, and the master's office. In the basement of this building is a large room in which are kept the elaborate appliances for the fire drill. There are also found here well-appointed shower-baths and toilet-rooms.

## EQUIPMENT.

All departments of the school, both mechanical and academic, are thoroughly equipped for efficient work by most approved methods. Indeed, the school is intended to be a model in these respects, and no expense of thought, labor, and money has been spared to make it such.

**The Wood-working Room,** on the east side (Fig. 6) of the building, is fitted for general carpentry, and on the west side for wood-turning and pattern-making. **The Carpentry Department** is fitted to accommodate twenty pupils. The benches are of such size and so arranged that every boy has ample room. In each are drawers with locks, in which each pupil may keep his individual tools and his finished work; there is also a cupboard designed to hold most of the implements used in common by the several occupants of the bench. The individual tools in the drawers are a block plane iron; a jack plane; a fore plane; and two chisels, $\frac{3}{4}$ and $1\frac{1}{4}$ inches. The implements used in common are a bit brace; try square; hammer; bevel; plain boxwood rule; dividers; boxwood scratch gauge; screw driver; chisels, $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, and $\frac{1}{2}$ inch; knife; back saw; cutting-off saw; splitting saw; two winding sticks; block plane; bench hook; and a dust brush. Of these implements the saws are kept in a special case in a tool-room in the centre of the main room; they are numbered to correspond with the benches, and each pupil is charged with those which he receives, and is held responsible for their return in good condition at the end of each working period. Blue-prints of the drawings from which all work is done, held in frames with glass fronts, are hung on standards erected for the purpose at the middle of each bench, so that

Fig. 6. — The Wood-working Room — Carpentry and Joinery.

they can be readily seen at a glance while the pupil is at work. This frame is designed to hold not only the blue-print in use, but also all the blue-prints of the course, the back of the frame being easily removed so that any print may be placed to the front as needed. Conveniently located for preparing materials for the pupils is a double arbor bench-saw quickly adjustable for either cross-cutting or splitting, and furnished with all necessary devices for facilitating work. Glue-pots heated by steam are near the benches and always ready for use.

**The Wood-turning and Pattern-making Department** (Fig. 7) is furnished with a bench running the entire length of the west side of the room, supplied with pattern-makers' tools, and arranged to be used by pupils in divisions of fifteen. There are attached to this bench at proper distances twelve quick-action vises, and near each vise is a set of three drawers, one of which is assigned to each pupil to hold his unfinished work and his individual tools. These are plane irons for each plane; paring chisels, $\frac{3}{4}$ and $1\frac{1}{4}$ inch; turning chisels, $\frac{1}{2}$ and $1\frac{1}{4}$ inch; and a $1\frac{1}{4}$-inch gouge. By the side of the drawers in each section is a locker to contain tools used in common by members of different divisions. These are a brace bit; try square; hammer; bevel; plain boxwood rule; dividers; boxwood scratch gauge; screw driver; $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ inch chisels; knife; back saw; cutting-off saw; splitting saw; Stanley's knuckle-joint block plane; Stanley's iron jack-plane; contraction rule; inside-bevel pattern-maker's gouges, $\frac{5}{8}$, $\frac{3}{4}$, and $1\frac{1}{2}$ inch; two winding sticks; dust brush; and bench hook.

Parallel to this bench and at a convenient distance from it is a row of twelve wood-turning lathes, each having a 6-foot bed and being capable of doing work 12 inches in diameter. Each has a drawer, fitted with a lock, to hold the following tools used in wood-turning: — Six-inch inside and outside calipers; $1\frac{1}{4}$ and $\frac{1}{2}$ inch gouges; $\frac{1}{4}$, $\frac{1}{2}$, and $1\frac{1}{4}$ inch chisels; a cutting-off tool; round-nose tool; diamond-point tool; dividers; an oil stone and oiler. At the end of this row is a large pattern-maker's lathe with 8-foot bed and capacity for doing work 20 inches in diameter. It is fitted with the most approved devices for doing all kinds of work, and is intended to be used by the instructor only and by pupils who develop special skill and

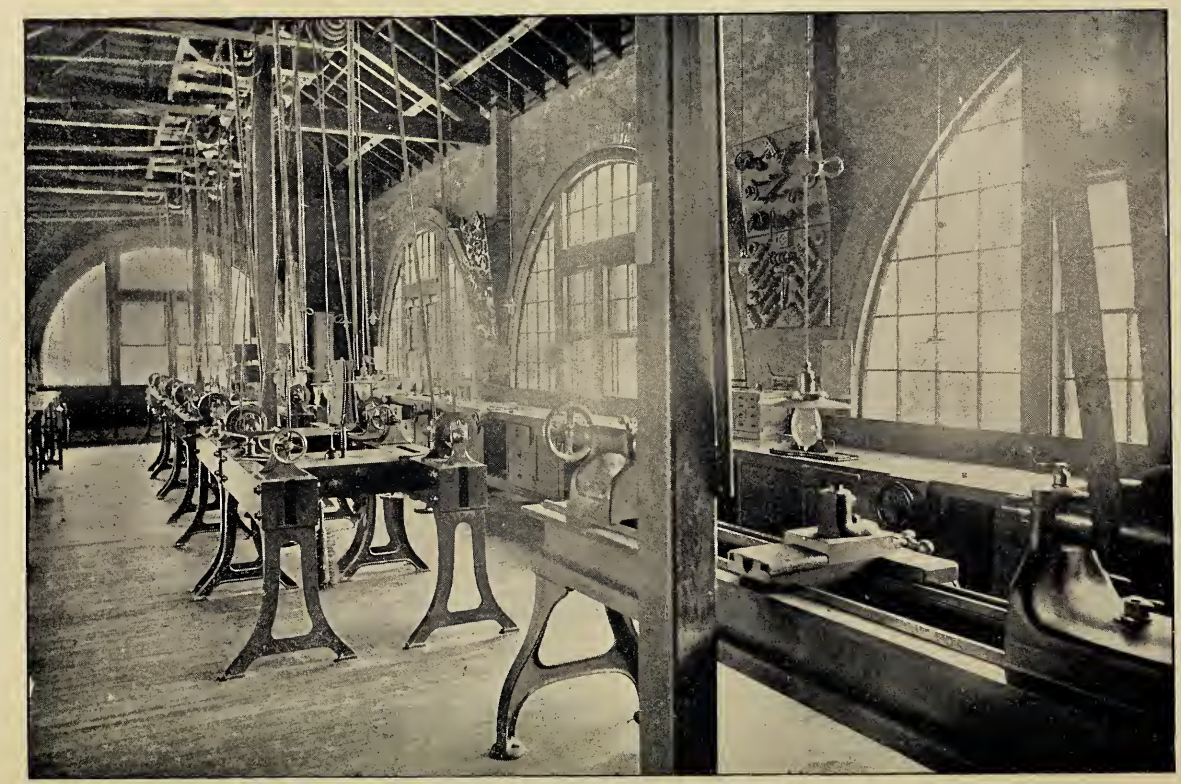


Fig. 7. — The Wood-working Room — Wood-turning and Pattern-making.

ability to do work of exceptionally high order. By its side are three iron speed-lathes of 9-inch swing and 42-inch bed, constructed by members of the classes of '91, '92, and '93. Near by is a band saw with 26-inch wheel, of the most approved pattern and fitted with an adjustable iron table. A jig saw is conveniently placed at the opposite end of the room. Located in the centre of the room is a tool closet supplied with a sufficient number and variety of tools for every possible need in the wood-working department.

**The Iron-working Room,** like that devoted to wood-working, is fitted for two kinds of work. The west side is furnished with appliances for general fitting, chipping, filing, drilling, scraping, etc.; the east side with appliances required for use in machine-shop work.

To accommodate the classes in **Metal-working by Hand-tools,** there are (Fig. 8) five benches 3 feet high, and having a top 9 feet by 3 feet 8 inches. A vertical wire screen, 24 inches high, divides the top of each table in the centre, and serves to protect pupils on opposite sides from the chips which fly from each other's work. Each side is furnished with two vises and two sets of four drawers, the upper one of which in each set is used in common by pupils of different divisions. One of the three others is assigned to each pupil to hold his individual work and tools. These are a cape chisel; a flat chisel; an 8-inch hand bastard file; a 10-inch half-round second cut file. At the beginning of each lesson each pupil gets from the tool-room a tray fitting the upper drawer of each set and containing the following tools, with the exception of the hammer, which remains in the drawer: — 3-inch hardened steel try-square; outside spring calipers; spring dividers; 4-inch steel scale graduated to $\frac{1}{64}$ inch; scratch awl; prick punch; centre punch; centre chisel; file card; brass vise jaws; ball-peen hammer, $1\frac{1}{4}$ lb.; box of oiled waste to be used in chipping; and a box of chalk. Besides the above-named benches, there is a side bench furnished with tools needed for special work. There are also four small speed-lathes, two of which were built by the pupils, for drilling, hand-turning, and polishing.

The equipment of the **Machine-shop Department,** on the opposite side of the room (Fig. 9), consists of one 11-inch, seven 14-

Fig. 8. — Iron-working Room — Iron-fitting and other metal work using hand-tools.

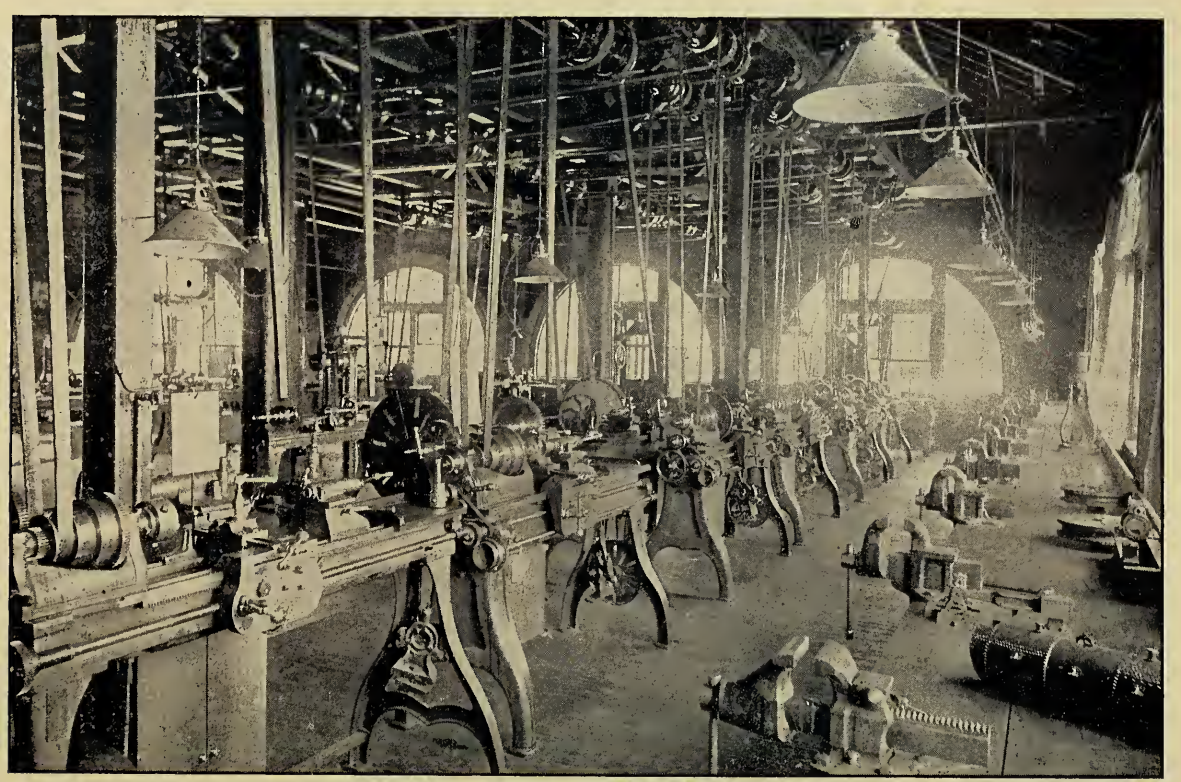


Fig. 9. — The Iron-working Room — Machine-shop.

inch, and four 16-inch engine lathes; a 24-foot planer; a 15-inch shaper; a 24-inch upright drill; a sensitive drill; a universal milling-machine; a No. 4 arbor-press; a power hack-saw; a Walker reamer and cutter grinder; a 36-inch grindstone; and an emery grinder. The entire side of the room is occupied by a bench like that in the pattern-making department, fitted with twelve machinists' vises and as many sets of drawers. In the upper drawer of each set are a ball-peen hammer and a babbitt hammer, each of $1\frac{1}{4}$ lbs. weight, and a monkey-wrench. A tray obtained from the tool-room by each pupil at the beginning of every working period contains the following: — 4-inch hardened steel try-square; Starrett's outside calipers; outside spring calipers; plain inside calipers; spring dividers; a 6-inch steel scale graduated to $\frac{1}{64}$ inch; centre gouge; scratch awl; centre punch; prick punch; centre chisel; file card; small oil-stone; brass vise-jaws; box of chalk; and key to upper drawer. The tool-room is furnished with drills, reamers, arbors, taps, and all other necessary tools in variety and number sufficient to supply each pupil with whatever he needs to complete a given job. These he obtains at the tool-room by depositing a check for them, of which he is furnished with a given number, and which takes the place of the tool received until he returns it in good condition. Under each lathe is a small cupboard containing wrenches, change gears, and other lathe accessories. Similar arrangements are made for accessories of other machines.

All the machinery in the building is driven by an engine located in a fenced-off section of the iron-working room, which is under the charge of a competent engineer.

**The Forge-room** (Fig. 10) is furnished with fifteen Sturtevant portable forges, each connected by proper pipes with a blower and with an exhaust fan, to prevent the poisoning of the air by coal gas, and to secure proper ventilation. These forges are supplied with a shovel, a poker, a rake, ten pairs of tongs fitted for handling iron varying from $\frac{1}{8}$ to $\frac{7}{8}$ inch in diameter, a dipper for sprinkling the fire, and a coal-hod. Near each forge is an anvil and a tool bench. Each bench has a set of three drawers occupying the entire space below the top. Upon the benches are $\frac{3}{4}$ and $\frac{3}{8}$ inch swedges; $\frac{1}{2}$ and $\frac{5}{8}$ inch fullers; flatter; set hammer; hand hammer; hardy; hot chisel and cold chisel;

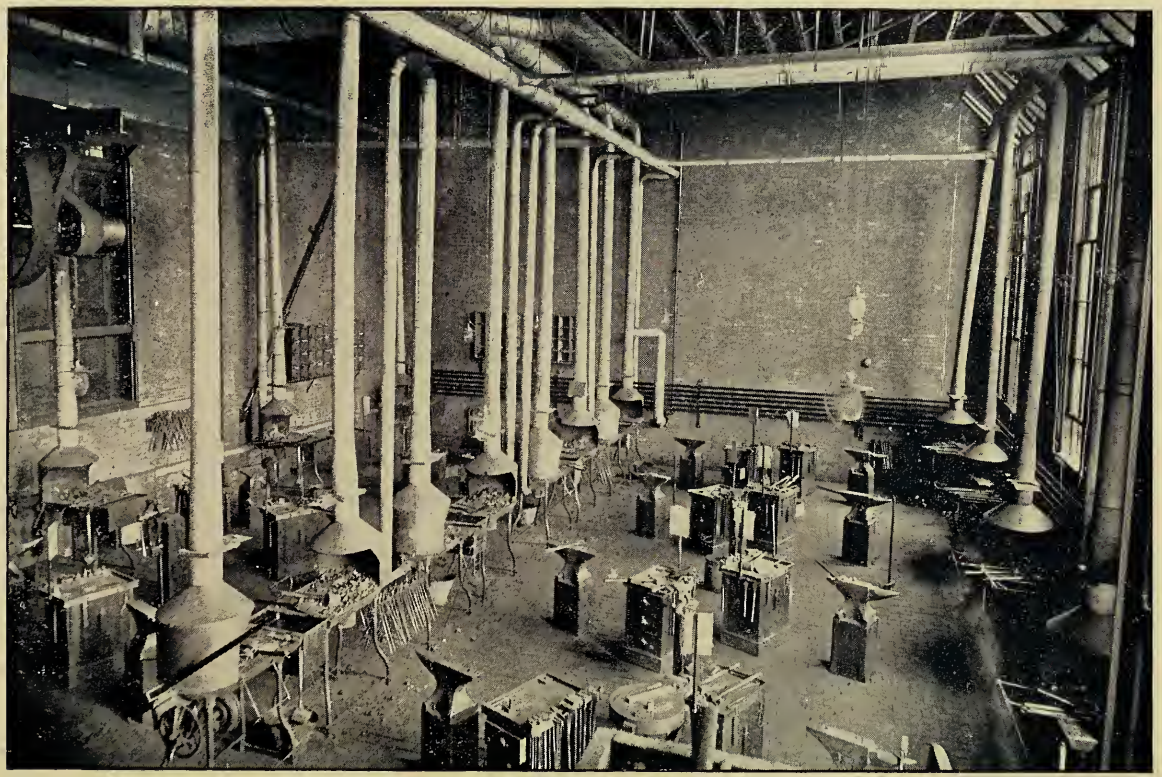


Fig. 10. — Forge-room.

square; 2-foot boxwood rule; outside spring calipers; and heading tools, $\frac{5}{16}$ to $\frac{1}{2}$ inch. A standard, three feet high, is attached to the back of each bench to support the blue-prints from which the pupils work. There are also in the room, conveniently and firmly located, six wrought-iron blacksmiths' vises. Other tools of various sorts, used for special kinds of work, are found in different parts of the room. Indeed, nothing is wanting which is likely to be needed in practical forge-work. The boilers which generate steam for heating the buildings and running the machinery are also located in this room.

**The Drawing-rooms** are two in number; one being used for the elementary work of the first two years of the course, and the other for the advanced work of the last two years. They are both high, well-lighted, and spacious.

The room for the first two years' work (Fig. 11) contains eighteen double tables, 36 inches high, with tops 24 by 76 inches. Each has two large drawers to hold the implements used in common by pupils of different divisions. These implements are two celluloid transparent triangles, such that angles of 30°, 45°, 60°, and 90° may be laid off from them; three French curves; German silver compasses, with attachments; an architect's triangular boxwood scale; German silver hair-spring dividers; Alteneder's ruling-pen and bow-pen. Each boy is supplied with a drawing-board and T-square. All the tables are furnished with twelve small drawers, with locks, so that each pupil may be assigned a private drawer in which to keep his finished or unfinished work. The teacher's platform is elevated three feet above the floor, thus enabling the most distant pupil to get an unobstructed view of objects placed upon the teacher's table, and of illustrations upon the blackboards, the lower edges of which are three feet above the platform. There are three of these blackboards, arranged one in front of the other, in a fixed framework, each movable, and having a counterbalancing weight attached so that it may be readily dropped down out of sight. At the other end of the room is the apparatus used in making blue-prints. The preparation of these is one of the most important functions of the drawing department, inasmuch as all the mechanical work of the pupils is based upon drawings and designs made by the instructors and advanced students.

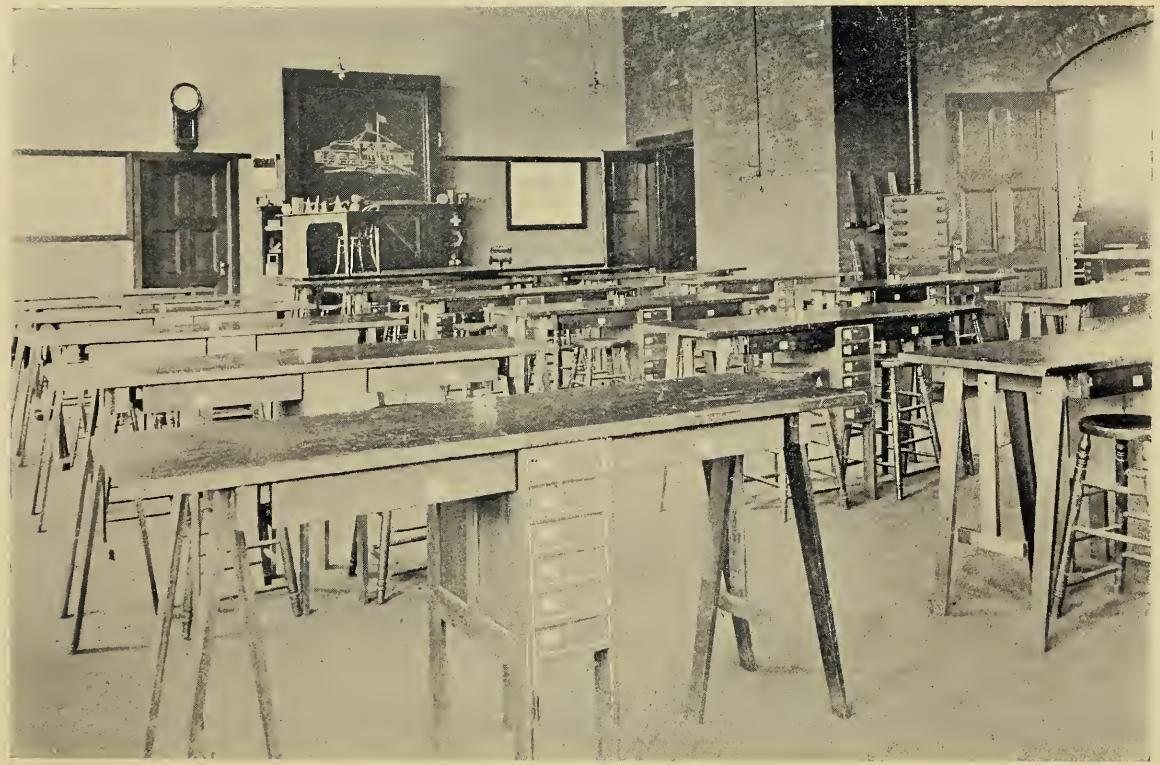


Fig. 11. — The Drawing-rooms.

The room for advanced drawing is furnished with the improved tables already described. Racks for drawing-boards are placed near the doors, so that pupils can get them conveniently as they enter the room, and put them again in place as they leave. There are cabinets and drawers for the preservation of work, containing a collection of fine specimens. A number of the finer drawings have been framed and hung upon the walls.

All the appointments of these rooms are first-class in every particular, and the work to which they are devoted is designed to be thorough and comprehensive. No pains have been spared to make the most efficient arrangements for rendering the work of this department of superior excellence.

**The Power** for operating the machinery is furnished by a first-class automatic engine built by C. H. Brown, of Fitchburg, Mass. The steam is taken from two horizontal tubular boilers of forty horse-power each, which also furnish steam for heating both buildings. Connected with the boilers is a duplex Blake pump and the best safety and regulating attachments, including Reliance water-columns, damper regulators, reducing valves, nickel-seated pop-valves and safety-valves of the lever pattern. The engine-room is equipped with a limited number of instruments for experimental and test work.

*In the winter of* 1896 *a test of a rotary engine was made under the supervision of the engineer.* The testing apparatus used was a "prony brake," of simple but effective design, made by members of the senior class. The satisfactory results of the test, and the interest manifested in it by those who took part, will justify a repetition of this exercise and the introduction of other tests in the near future.

In the engine-room is also placed a direct-current dynamo which furnishes current for two hundred and fifty twenty-candle-power lamps used in the shops in the short days of winter and for evening work. The buildings are also supplied with the alternating current by the Cambridge Electric Light Company, and with arc lamps. The several circuits required to carry current in two forms to the various rooms of both buildings are controlled by a multiple switch-board placed in the engine-room and under the sole charge of the engineer. Its position is shown in Fig. 12. The engineer is also responsible for the bells controlling the programme for the entire school.

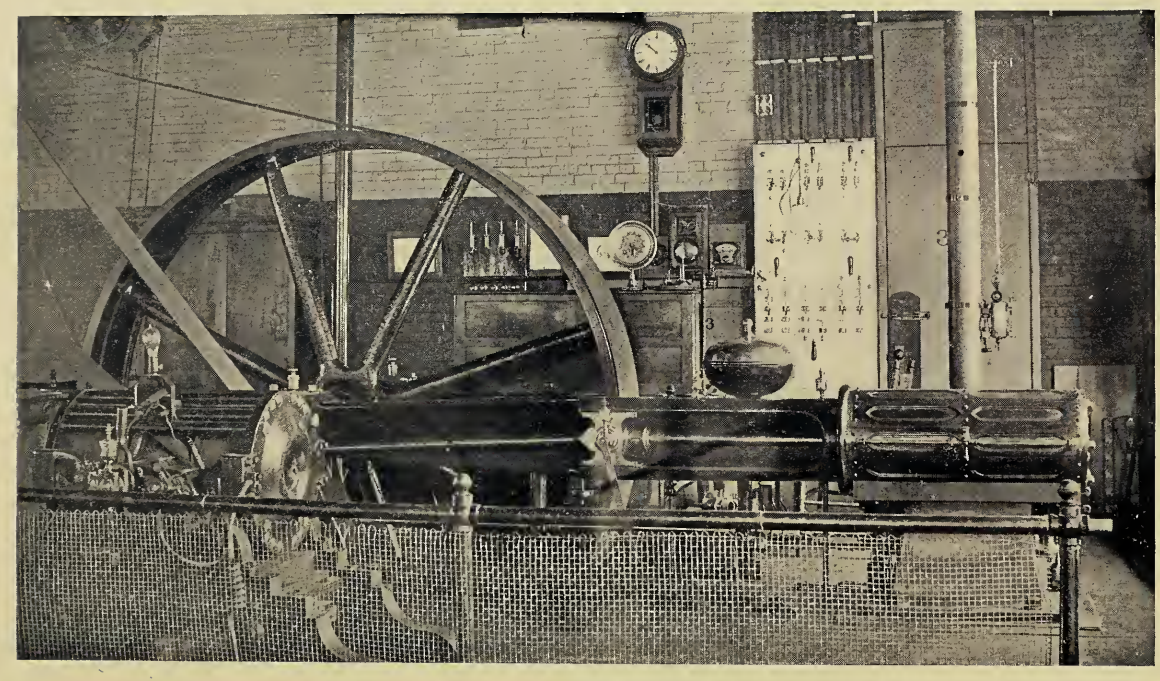


Fig. 12. — The Engine-room.

**The Academic Building** is as well equipped as that devoted to the mechanical part of the school's work.

**The Assembly Hall** (Fig. 17), besides its use for other exercises of the whole school, is used twice each week for a general exercise in singing, under the direction of a competent leader and instructor. It is also used for a general drill of the pupils in marching and other semi-military exercises. To adapt it to these various uses, it is furnished with seats readily movable. In front is a spacious stage suitably furnished. An oil portrait of the late Superintendent Ellis occupies an appropriate place upon the wall above the stage.

**The three School-rooms**, one of which is shown in Fig. 15, are each seated for 49 pupils with the Whitcomb single lid-desks with chairs. There are also additional seats for use when a

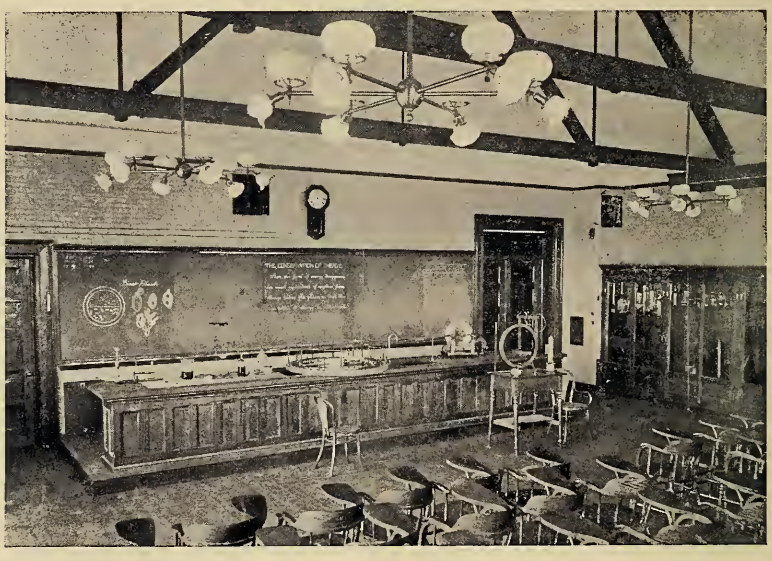


Fig. 13. — Science Lecture Hall — English High School.

larger number of pupils are to be accommodated. The blackboards in these rooms are of slate. The walls are adorned with framed photographs of the World's Fair at Chicago, and of

Fig. 14. — A Corner in the Physical Laboratory.

natural scenery. In one of these rooms are convenient arrangements for the storing of books and other appliances, and a case for reference books. Connected with one of them is a retiring-room, tastily and comfortably furnished for the lady teachers employed in the school.

**The Physical Laboratory** is intended to be and is considered a model of its kind. It is planned for class instruction, but some provision is made for necessary individual work and for lectures on special subjects. For lecture purposes an especially good outfit for projection is provided, in which an arc light can be used. There are properly arranged in the laboratory eight tables, each large enough for four pupils and adjustable to either a sitting or a standing position. In each are four drawers for note-books and apparatus. A firm frame rises four feet above the middle of each, to which is attached a bar which may be easily moved and clamped at any desired elevation, and connected with which are rods for supporting balances and other appliances. There is also a lecture table furnished with drawers and lockers, and supplied with gas and hot and cold water. Along the two outside walls — the windows being high enough to permit this arrangement — are shelves of slate two feet wide and nearly two inches thick, forty inches above the floor, supported on heavy brackets firmly bolted to the brick walls and entirely independent of the floor. These shelves or wall-tables secure the stability required for certain experiments. Under them are placed cabinets, nine in number, each containing six drawers and two lockers, thus making accommodations for eighteen pupils to work at the same time. The wall-tables are supplied with gas, water, and electricity within reach of the pupil as he stands in his place. Under each of the water faucets are drip-sinks with proper drainage. The laboratory is well supplied with electricity. The direct current at a tension of either 6 volts or 80 volts may be supplied to the students' tables, and is accessible to the instructor at a tension of 110 and 500 volts. The alternating current at 110 volts is also easily accessible. Conveniently located on the west partition wall is a complete set of meteorological instruments, and also a standard pendulum electrically connected with a sounder for ticking off seconds accurately.

Fig. 15. — One of the School-rooms.

Connected with the laboratory is a spacious apparatus-room, which may also be used as a dark-room for photometry and as a developing-room in photography. In this room are stored for use as needed apparatus for elementary and accurate measurements of the fundamental physical quantities, length, mass, and

Fig. 16. — Chemical Laboratory — English High School.

time; instruments designed for measurements in heat and electricity; and also those needed to illustrate physical principles qualitatively.

All the rooms in this building are heated and ventilated by the Sturtevant system. The engine used for this purpose is in the basement of the building, steam being furnished by the boilers in the other building. All the rooms are furnished with electric lights. The hall and corridors can be lighted either by electricity or gas. Lavatories are placed in the corridors, in the ladies' retiring-room, and in the master's office, and are supplied with both hot and cold water.

Fig. 17. — The Assembly Hall.

## THE COURSE OF INSTRUCTION.

A three years' course of instruction, adopted tentatively upon the organization of the school, was followed, with some modifications, until 1893, when the present four years' course was entered upon. A new and growing school, especially one of the pioneers in undeveloped fields of educational forces, could hardly be expected to fix upon the details of a plan which should be unalterable. The course outlined on page 11, and more fully explained below, was the outgrowth of the first five years of experience in the management of the school, and although slight changes are desirable, and are contemplated in the work of the third and fourth years, it is believed to be, on the whole, a very satisfactory scheme for working out the distinctive aims of the school. It is evident that a strong effort is made to give proper emphasis to the academic features of the course, and to make that work more interesting and effective by bringing it into intimate relation with instruction in the mechanic arts. Not only is the school peculiarly adapted to the needs of all boys who, having little aptitude for abstract study, wish to learn in a practical way the principles which underlie the processes involved in the various manual employments, but it is also believed to offer unsurpassed advantages to boys who wish to prepare for the Lawrence Scientific School, the Massachusetts Institute of Technology, or any similar institution. The manual dexterity and the thorough knowledge of tools, machinery, and mechanical processes acquired in the shops, at an age when time can be most easily spared for such training, is of inestimable value in any scientific pursuit.

**Strength of the Academic Instruction.**

**First Year. Class IV.**

| English High School. | Hours per Week. | Months. | Manual Training School. | Hours per Week. | Months. |
|---|---|---|---|---|---|
| Elementary Algebra... | 5 | 10 | Drawing ..... | 5 | 10 |
| English History..... | 3 | 7 | Carpentry and Joinery | 10 | 5 |
| Civil Government ..... | 3 | 3 | Iron-fitting ..... | 10 | 5 |
| English Language } English Literature } .. | 2 | 10 | | | |

*The course in algebra* includes definitions and notation, addition, subtraction, multiplication and division, factoring, fractions, equations of the first degree with one or more than one unknown quantity, powers and roots, radicals and affected quadratic equations.

The text-book prescribed for the course in English history is Montgomery's "Leading Facts." The topical method of instruction is employed, and the boys' note-books contain topics, historical maps, notes of collateral reading, important dates, and various other memory aids. Photographs of persons, places, and scenes, guide-books of the Tower of London and Westminster, fac-similes of the Magna Charta, of famous death-warrants, and of the earliest newspapers printed are utilized as helps in this study.

*The course in civil government* is based upon Dawes's "How We Are Governed." The methods used are similar to those employed in the teaching of history.

*The instruction in English* follows the plan of Chittenden's "Elements of English Composition." Frequent themes are required. The literature studied is selected from the leading American authors, and includes both prose and poetry.

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*The course in drawing* includes the following: — Use of T-square, triangles, scale, pencil and compass, mechanical alphabet and its applications, geometrical constructions, projections, prisms, cylinders, etc., dimensioning, intersections and developments, and tests.

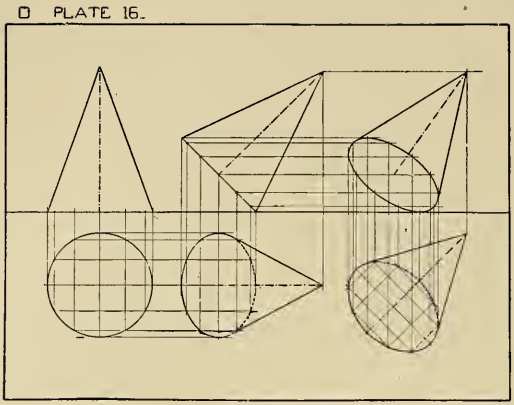


Fig. 18. — Simple Projection. (Cone.)

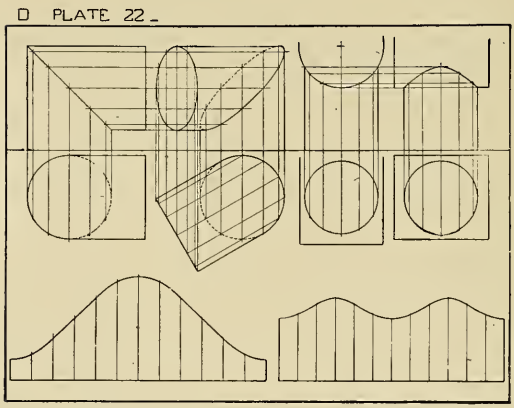


Fig. 19. — Simple Development. (Stove-pipe.)

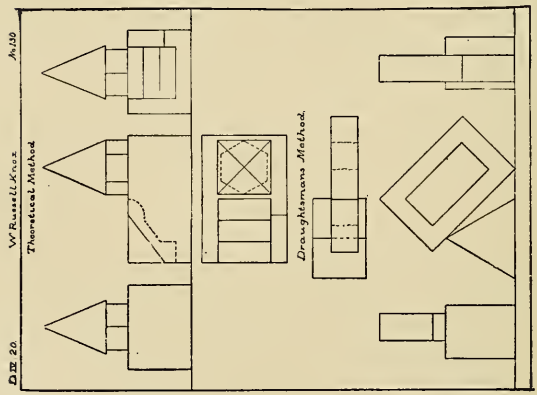


Fig. 20. — Practical Projections. Theoretical and Draughtsman's Method.

*The course in carpentry and joinery* is as follows: — Saw and chisel exercises, halved joints, blind mortise and tenon joints, open mortise and tenon joints, halved dovetailed joints, dovetailed joints, brace joints, boring exercises, dowel joints, table leg and rail, glued triangle having angles of 30, 60, and 90 degrees, model of a newel post, tool chest, shoe-blacking stand, etc.

The tools used are: — Rip, cross-cut, back, and keyhole saws; block, jack, rabbet planes and jointer; try square, chisels, gouges, bit stock, bits, level marking-gauge, hammer, nail set, mallet, screw driver, counter sink, brad awl, spoke shave, clamps, wood files, drawing-knife, mitre box, oilstone and grindstone.

*The course in iron-fitting* is as follows: — Chipping, filing, scraping, polishing, fitting of sliding parts, drilling, hand-turning, bolt-cutting, tapping, etc.

The tools used are: — Hardened steel try-square, outside spring calipers, spring dividers, steel scratch awl, prick punch, centre punch, file card, brass vise jaws, ball-peen hammer, cape chisel, flat chisel, and various forms and sizes of files.

**Second Year. Class III.**

| English High School. | Hours per Week. | Months. | Manual Training School. | Hours per Week. | Months. |
|---|---|---|---|---|---|
| Geometry | 3 | 10 | Drawing | 5 | 10 |
| Physics | 5 | 10 | Wood-turning | 10 | 5 |
| English Language, English Literature | 2 | 10 | Pattern-making | | |
| | | | Blacksmithing, Casting | 10 | 5 |

*The instruction in geometry* follows closely the plan of the first three books of Bradbury's "Academic Plane Geometry," *i.e.*, through the geometry of the circle. Very little is required in Books IV. and V., because the ground is covered by the practice in mechanical drawing. The aim of the course is to cultivate the power of close and accurate reasoning, by a careful study of model demonstrations. As much original work is required as seems consistent with a satisfactory study of the formal demonstrations outlined in this course.

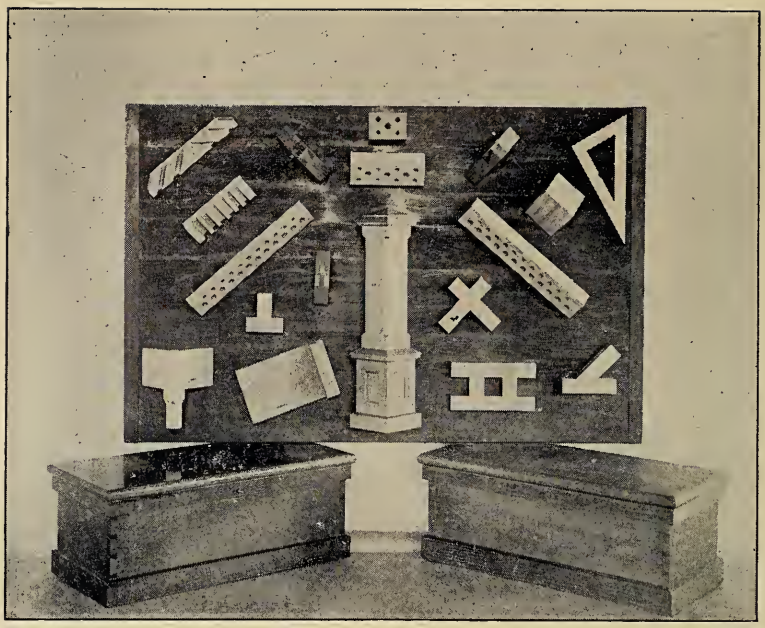

Fig. 21. — Exercises in Carpentry and Joinery.

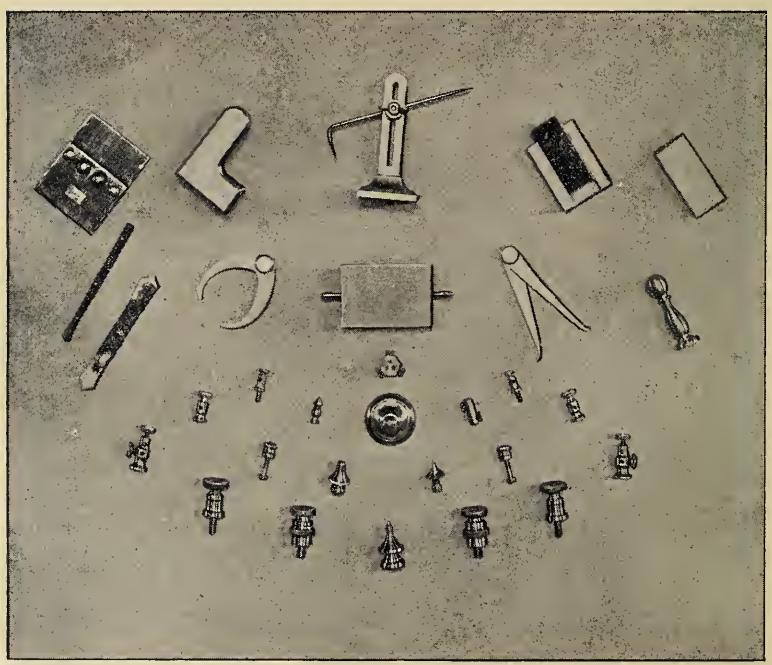

Fig. 22. — Exercises in Metal-working by Hand.

*The course in physics* aims to cover all the principal topics in a manner consistent with elementary treatment. An effort is made to avoid the fragmentary view of the subject which would be incident to a purely experimental course of one year, and at the same time to retain the advantages of laboratory methods. The method of instruction combines qualitative and quantitative laboratory exercises, of which carefully prepared reports are required, with lecture-table demonstrations by the teacher. There are frequent text-book lessons, and the necessary recitations and examinations.

*The second year's work in English* is based upon Lockwood's "Lessons in English." This course embraces an outline of the history of the English language and the elementary principles of rhetoric. Compositions form a part of nearly every lesson. The authors studied are Scott, Dickens, and Hawthorne.

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*The work in drawing includes the following:* — Inking with ruling pen and compass pen, shade lines, the standard bolt

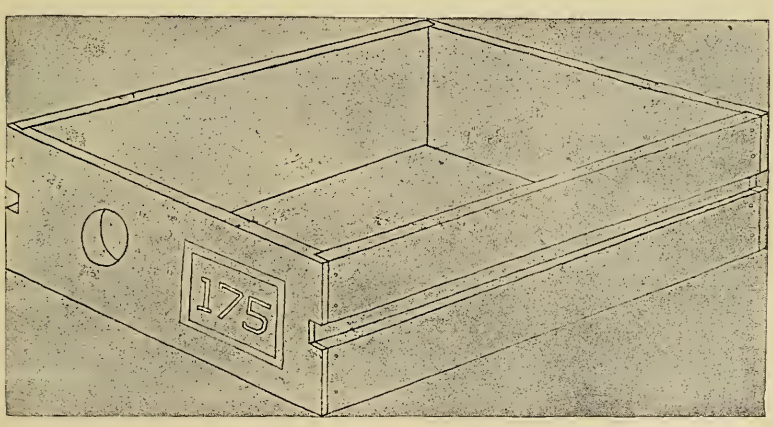


Fig. 23. — Practical Perspective. (Box.)

with formulas, machine drawing, dimensioning and specifying, freehand outline drawing, mechanical perspective, freehand perspective from models, freehand machine drawing, dimensioned constructions, intersection and development of plane

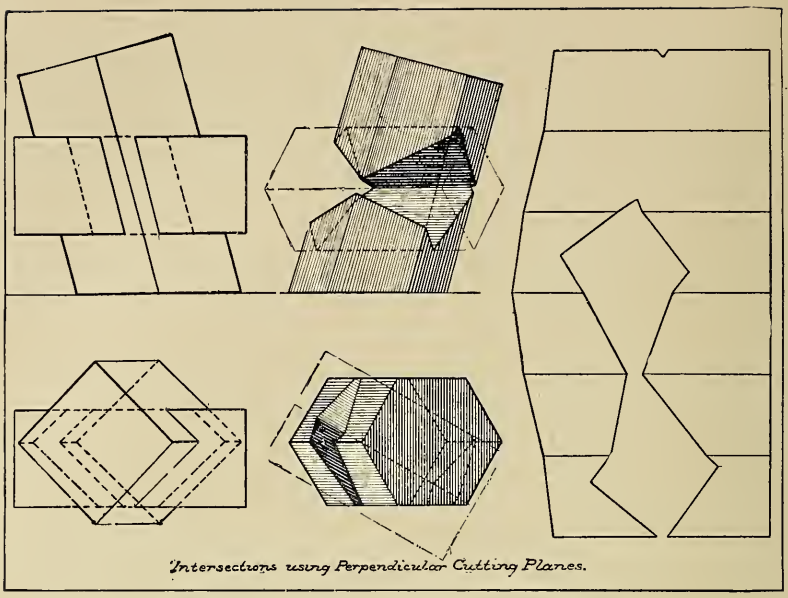


Fig. 24. — Intersections and Developments.
(Hexagonal and Square Prisms.)

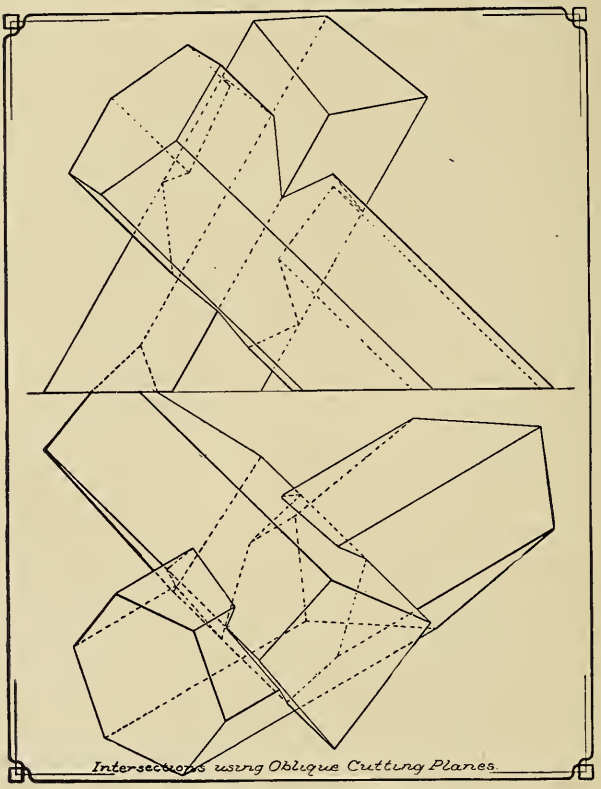


Fig. 25. — Intersections, illustrating the use of Descriptive Geometry.

surface solids requiring cutting planes, oblique projections, and tests. All sheets are executed in ink, except those for free-hand and mechanical perspective.

*The course in wood-turning* is preparatory to pattern-making, and consists of exercises in measuring with calipers and dividers,

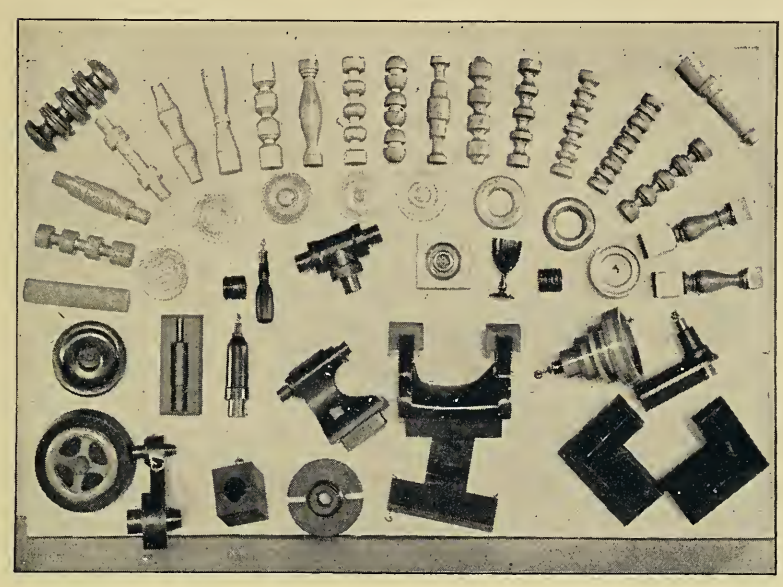

Fig. 26. — Exercises in Wood-turning and Pattern-making.

and in cylindrical, compound, conical, globe chuck, and face-plate turning.

The tools used are: — Wood-turning lathe, inside calipers, outside calipers, dividers, gouges, chisels, cutting-off tool, round-nose and diamond-point tools, oil-stone, and oiler.

*The pattern-making work* consists of instruction concerning moulding, draught of patterns, use of shrink rule, core prints, and core boxes; followed by exercises in laying out patterns, building up cone-patterns, jig-sawing, and all operations involved in making both solid and split patterns.

*The course in forging and blacksmithing* is as follows: — Exercises in care of fire, and in drawing, upsetting, bending,

riveting, welding, punching, and tempering. Some of the articles made are : — The wedge, square point, sign dogs, stone dogs, S-hooks, bent welded rings, harness hooks, truck-hangers, hooks and staples, swivels, shafting-keys, shaft with shoulders, bent angle-irons for strengthening joints, welded angle-irons, chain links, eye bolts and ring, clevice with bolt and cotter, bolts and nuts, square and hexagonal lathe tools, tempered spring, flat drill, hammer, blacksmith tongs, etc.

The tools used are: — Portable forge, anvil, hand hammer, rule, square, swedges, fullers, set hammer, hot chisel, cold chisel, hardy, outside spring calipers, heading tools, and various tools used in caring for the forge fire.

**Third Year. Class II.**

| English High School. | Hours per Week. | Months. | Manual Training School. | Hours per Week. | Months. |
|---|---|---|---|---|---|
| 1. Advanced Algebra, | 5 | 6 | Drawing (alternate | | |
| 1. Plane Geometry... | 5 | 4 | days)..... | 10 | 5 |
| 2. Physics ..... | 2 | 10 | Machine-shop (alter- | | |
| 2. Chemistry..... | 3 | 10 | nate days)..... | 10 | 5 |
| French ..... | 5 | 10 | | | |
| English Language } .. English Literature } | 3 | 10 | | | |

An option is offered between Nos. 1 and 2, the course including the mathematics being designed for boys who are fitting for higher scientific schools, and the course including the sciences for those who do not intend to enter the higher schools. No. 1 might be stated as reviews in mathematics required for admission to scientific schools.

*The mathematical work of this year* is designed to meet the admission requirements of the Massachusetts Institute of Technology in elementary algebra and plane geometry, which include all the topics of academic algebra, through geometrical progressions, and the first five books of plane geometry. The text-books used are Bradbury & Emery's "Academic Algebra" and Wentworth's "Elements of Plane Geometry."

*The advanced course in physics* assumes a knowledge of the

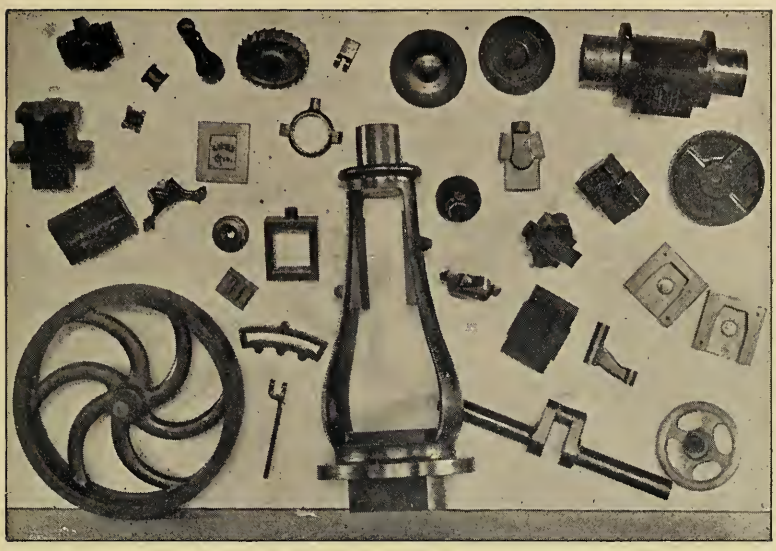

Fig. 27. — Exercises in Pattern-making.

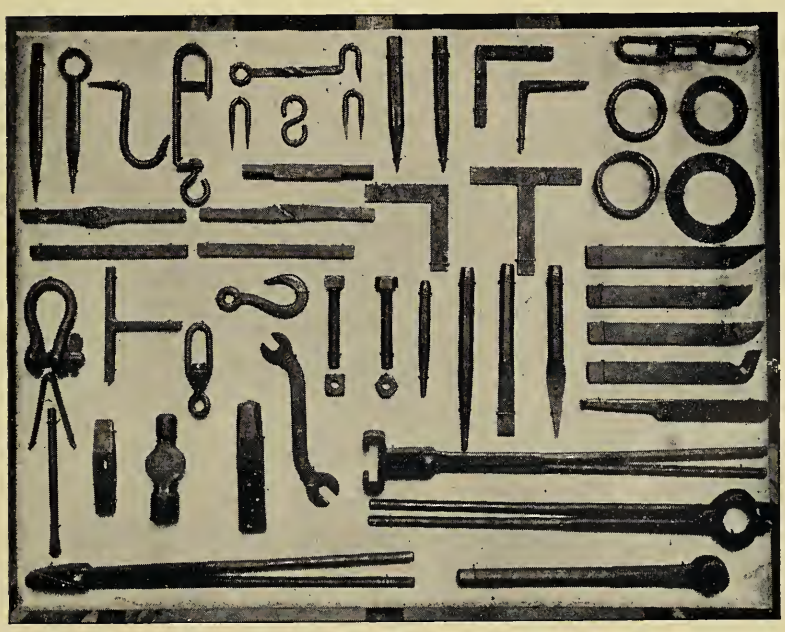

Fig. 28. — Exercises in Forging.

elements of the subject in general and such skill in manipulation as may be acquired in the elementary course of the previous year. The course is mainly experimental, and includes measurements in the metric units of length, mass, and volume; investigation of such laws as those governing the elasticity of wooden rods under flexure or torsion; the determination of such values as the breaking strength of wire, the coefficient of expansion of metals, the latent heat of water and steam, specific heat of metals, and the electrical resistance of wires both by substitution

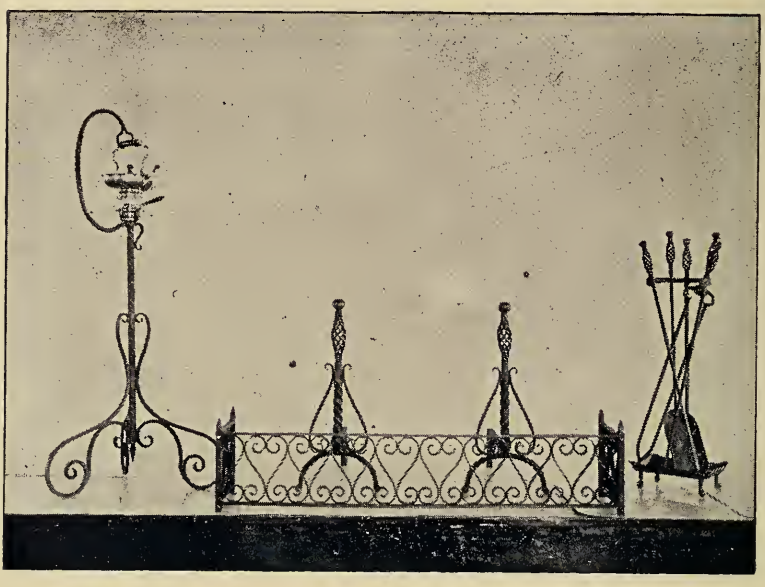

Fig. 29. — A Class Exercise in Wrought-iron Work.

and by the bridge method. The advance is in the line of more accurate methods of experimenting rather than in new subjects.

*The course in chemistry* consists of 40 laboratory exercises and 80 recitations or lectures. The experimental work includes 50 of the 100 experiments prescribed by the Committee of Ten. The topics are: Oxygen, nitrogen, hydrogen, carbon, acids, bases, salts, oxides of nitrogen, oxides of carbon, chlorine, bromine, iodine, sulphur, phosphorus, arsenic, silicon, glass,

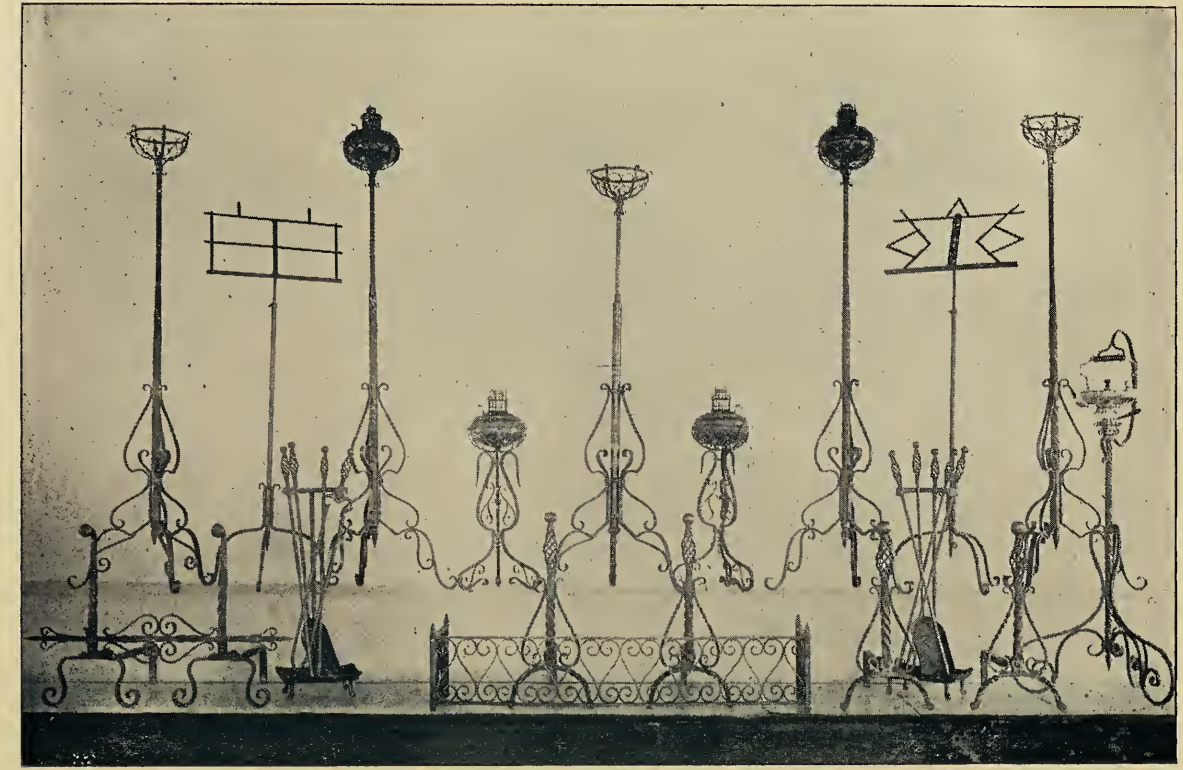

Fig. 30. — Special Pieces of Wrought-iron Work.

atmosphere, water, flame, calcium, magnesium, aluminum, zinc, lead, tin, mercury, silver, iron, illuminating gas, alcohol, bread, soap, Dalton's laws, Gay Lussac's and Avogadro's law with problems.

*The course in French* covers Otto's "French Grammar," Part 1, and the translation of Worman's "Premier Livre," "Peppino,"

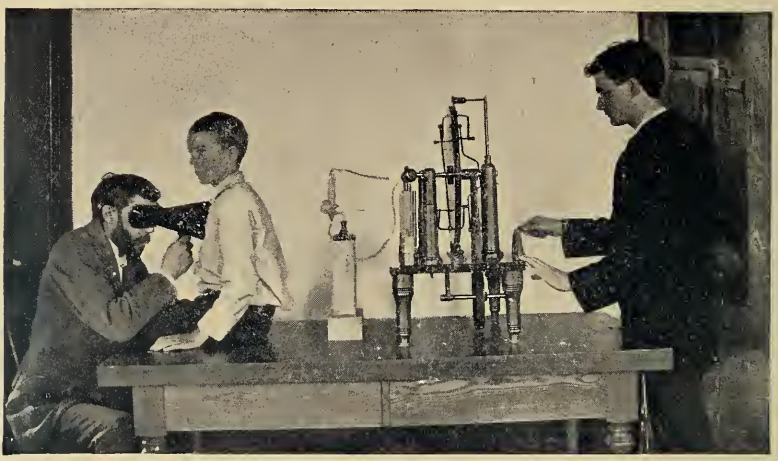

Fig. 31. — Making an Examination by means of the Fluoroscope and the X-rays.

"Les Récits de la Vieille France," "Le Pacte de Famine," and "Le Siège de Berlin." There is much translation of English into French, either orally or at sight, or in the form of written exercises prepared during the study period, or in class under the supervision of the teacher.

*The English of this year* includes daily themes and the reading of selections from standard authors.

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*The course in drawing is as follows:* — Projections; measurements of inclined lines with applications; geometrical constructions, such as mathematical curves, the helix with applications to screws, theory of conic sections, intersection and development of solids bounded by curved surfaces requiring the

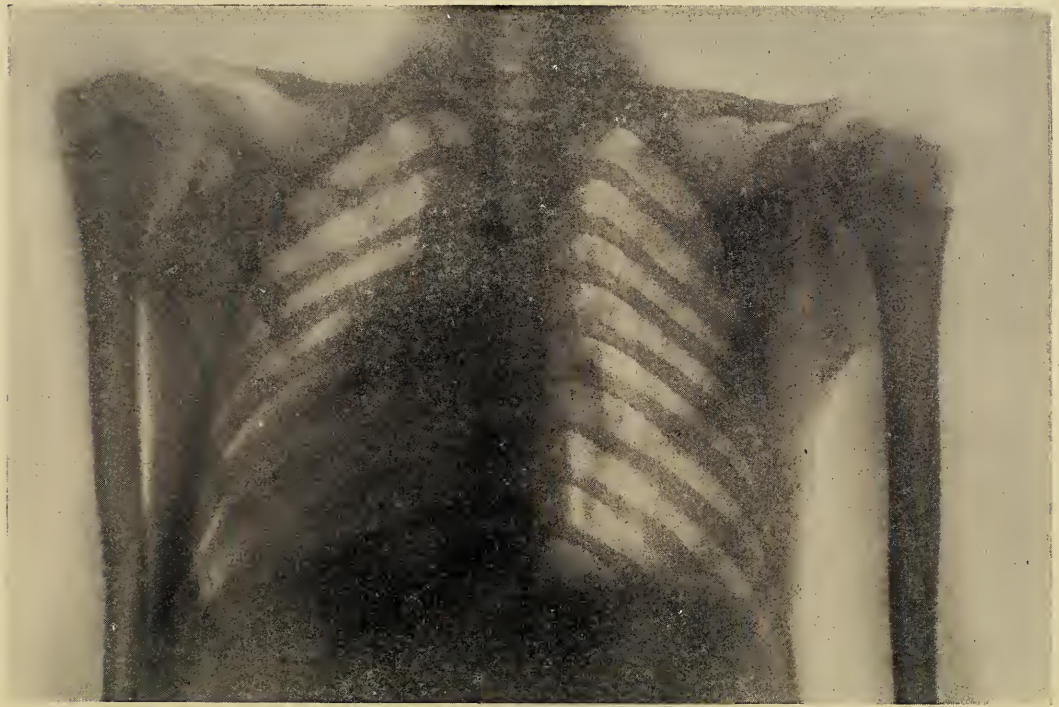

Fig. 32. — Copy of an X-ray Sciagraph of a Boy's Chest and Shoulders.

cutting plane; theory and execution of the spur gears; machine drawing (detail and assembled) specified and dimensioned for use.

Each student is treated as an assistant draughtsman in a large office. A complete machine is selected and each assistant draughtsman is given an idea of some part which he must develop, and of which he must produce a correct working drawing. At least two parts are thus treated, and each student makes two or more tracings of sheets not his own. From these he makes blue-prints on paper prepared by the class. The total time in the drawing office is about seventy hours.

*The machine-shop course for both third and fourth year* consists of lathe work, including the preparation of work for the lathe,

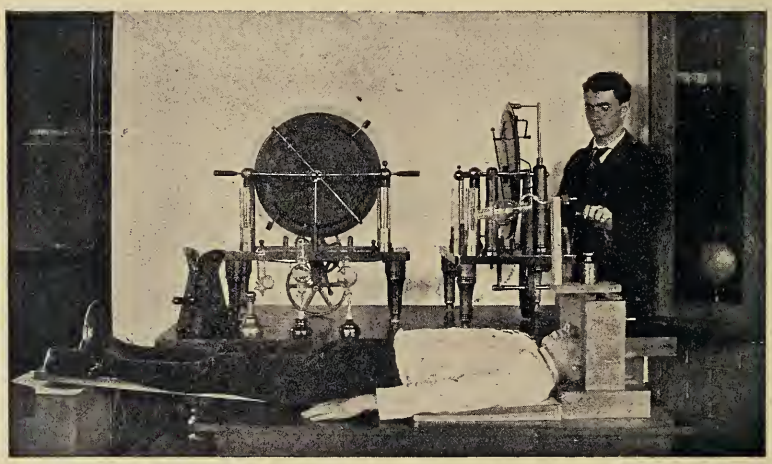

Fig. 33. — Making the X-ray Sciagraph of a Boy's Chest and Shoulders. (See Fig. 32.)

straight and taper turning, boring, chuck drilling, reaming, screw cutting, uses of boring bar, compound rest, taper attachment and fine measuring tools, planing on planer and shaper, milling, drilling, and boring in drill press, forming and grinding cutting tools, construction and assembling of machines, and the use of special tools.

The tools used are those of the first year, and also the engine lathe, planer, shaper, milling machine, upright drill, sensitive

Fig. 34. — A Group of X-ray Sciagraphs.

1. Fractured elbow joint.
2. Perfect hand.
3. Left foot, naked.
4. Right foot of same person encased in a pointed shoe.

drill, emery grinder, drills, reamers, arbors, taps, lathe dogs, and tools of every variety needed to complete a given piece of work.

Throughout the entire course the pupils in each shop work from prepared blue-prints giving details and specifications of the work, or from drawings specially prepared by themselves.

**Fourth Year. Class I.**

| English High School. | Hours per Week. | Months. | Manual Training School. | Hours per Week. | Months. |
|---|---|---|---|---|---|
| 1. { Solid Geometry / Reviews in Math. } | 5 | 10 | Drawing (alternate days) | 10 | 5 |
| 2. { Chemistry or / Botany } | 5 | 10 | Machine-shop (alternate days) | 10 | 5 |
| English Language / English Literature / U. S. History | 3 | 10 | | | |
| French | 5 | 10 | | | |

An option is offered between Nos. 1 and 2.

*Note.* — A change in the statement of the work in mathematics and science for the fourth year is contemplated, adding advanced algebra under No. 1 and inserting physics, or, as an alternate, the reviews in mathematics of the previous year, in place of botany. The addition of advanced algebra is demanded by present or prospective college admission requirements. The second change is suggested to meet the needs of those boys of Class I. who do not intend to enter the higher schools.

*The work of the class in advanced mathematics* has been divided between advanced algebra and solid geometry, three days of each week having been given to algebra and two to geometry during the fall and winter terms. The latter months of this year are spent in the necessary reviews in mathematics for the entrance examinations of the Lawrence Scientific School and the Massachusetts Institute of Technology.

*The work in English and history* for the advanced class follows the entrance requirements of the Institute of Technology and the Lawrence Scientific School. In English the books agreed upon by the colleges are read, and much written work is required. In history the class follows Johnston's "United States," but this book furnishes only a small part of the work done. From topics assigned with references to larger historical

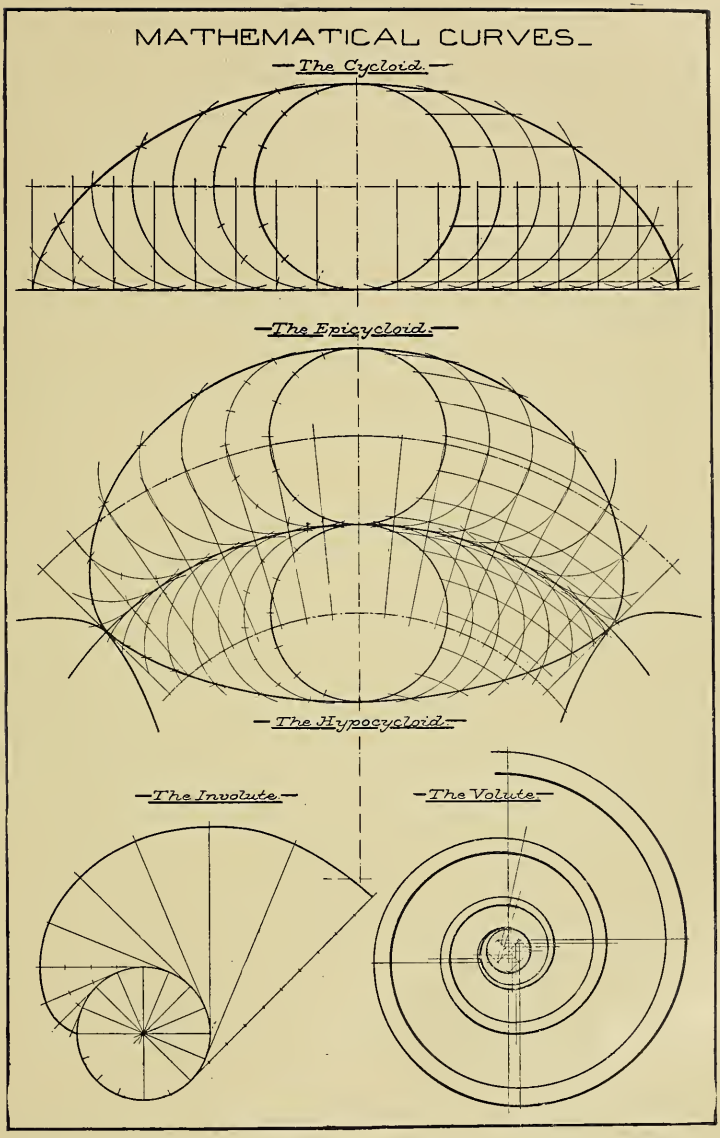


Fig. 35. — Advanced Practical Geometry.
(Mathematical Curves.)

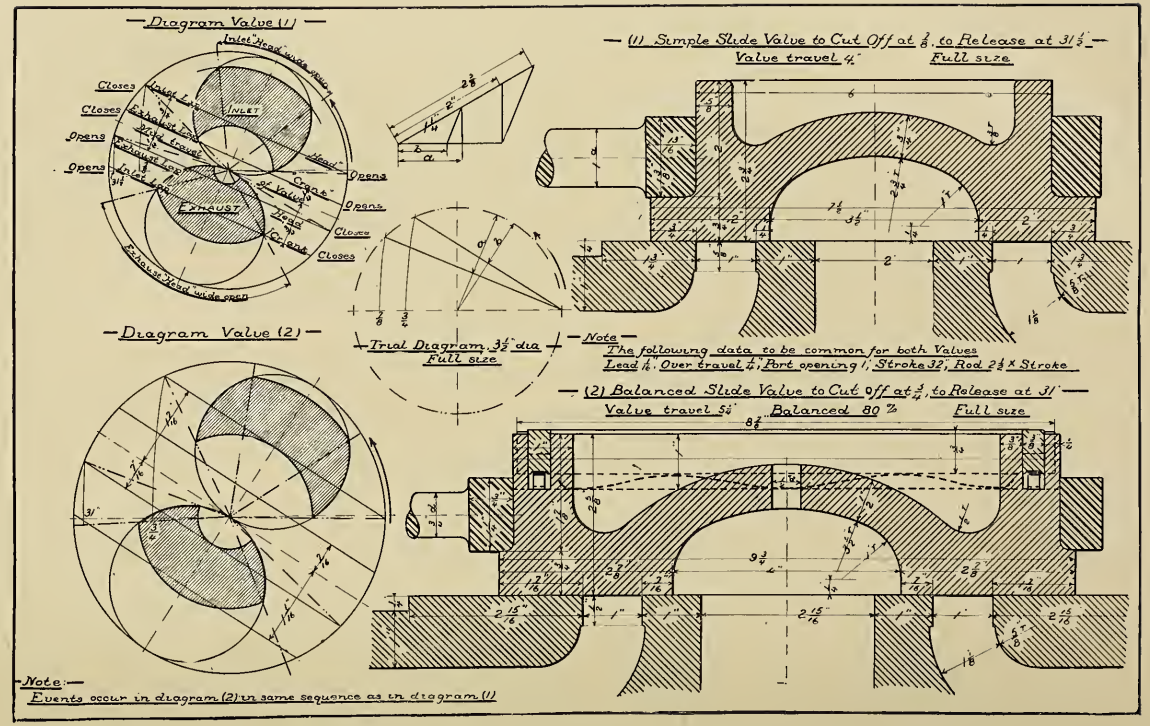


Fig. 36. — Design for Slide Valve, illustrating Machine-drawing.

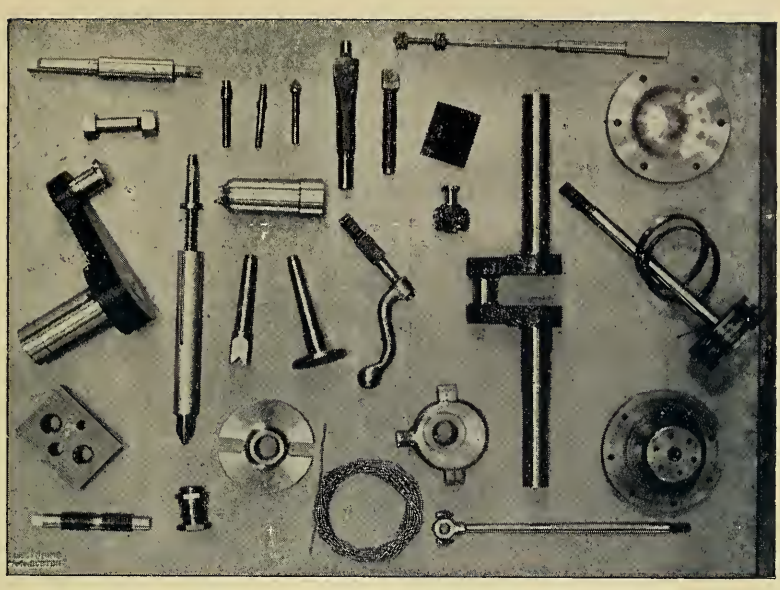

Fig. 37. — Machine-shop Exercise.

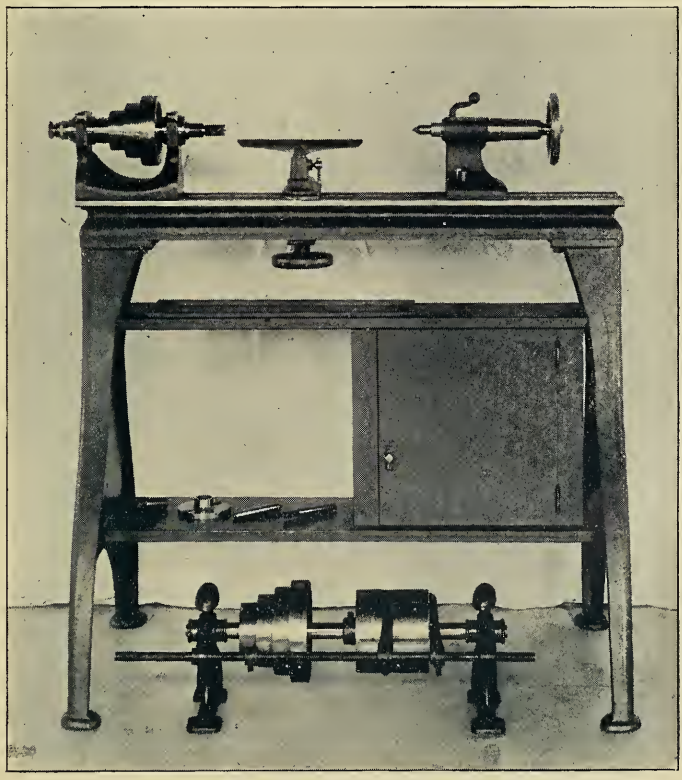

Fig. 38. — Class Exercise — Speed-lathe.

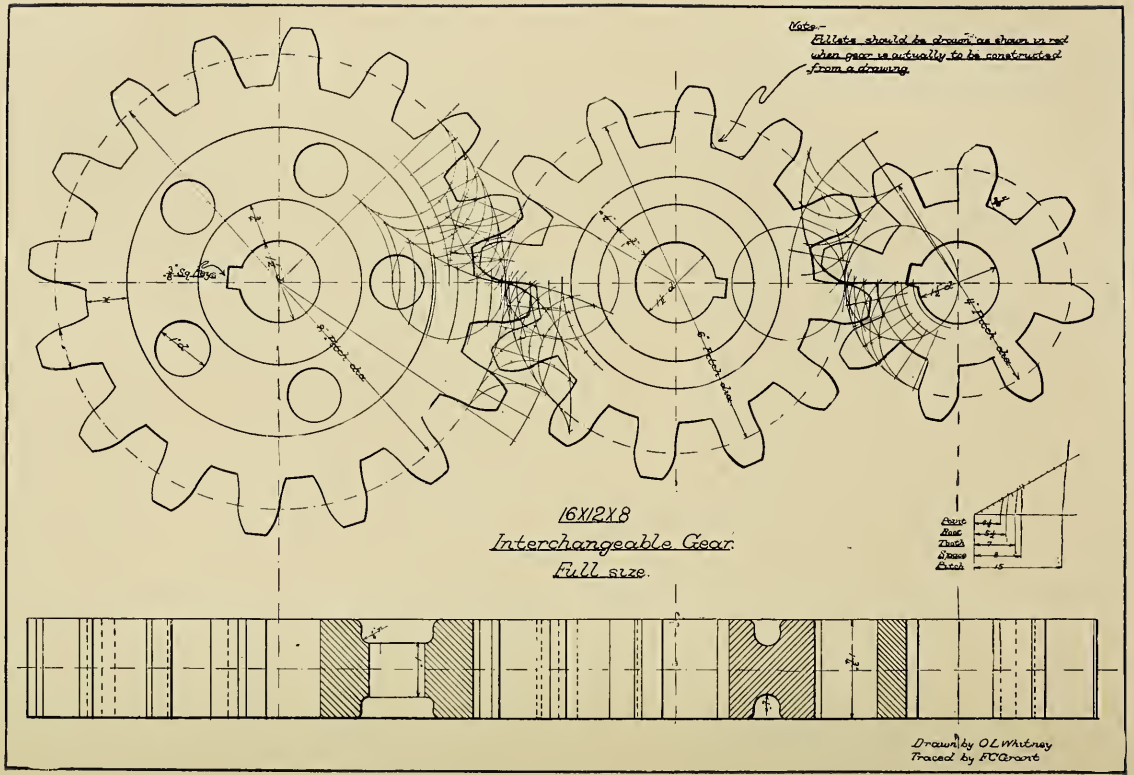


Fig. 39. — Spur Gear, illustrating Mechanism.

works, a thorough study is made of the more important phases of American history; essays are written upon the lives of our great statesmen and different historical movements; and something is attempted in the way of individual and voluntary study of some

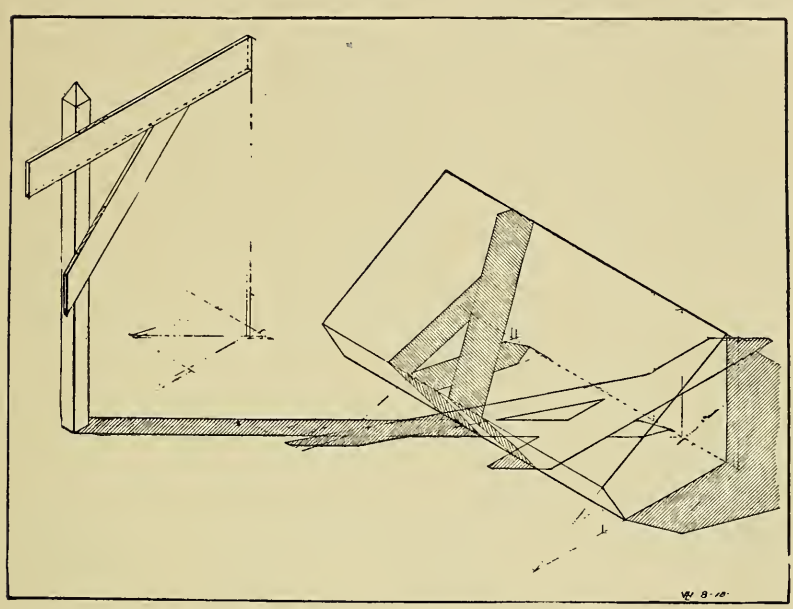

Fig. 40. — Isometric and Cast Shadows.

epoch or event. The English history required for entrance to the Lawrence Scientific School claims some portion of the time devoted in this course to history.

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*The drawing* in the regular course consists of machine mechanism, belting principles, bevel gears (elective), worm gears, rack and pinion (elective), assembling a machine from details (elective), projection and cast shadows, isometric projection and shadows, use of color washes and tints.

The student may, if he desires, substitute the following for the drawing marked "elective": — Architectural details, as

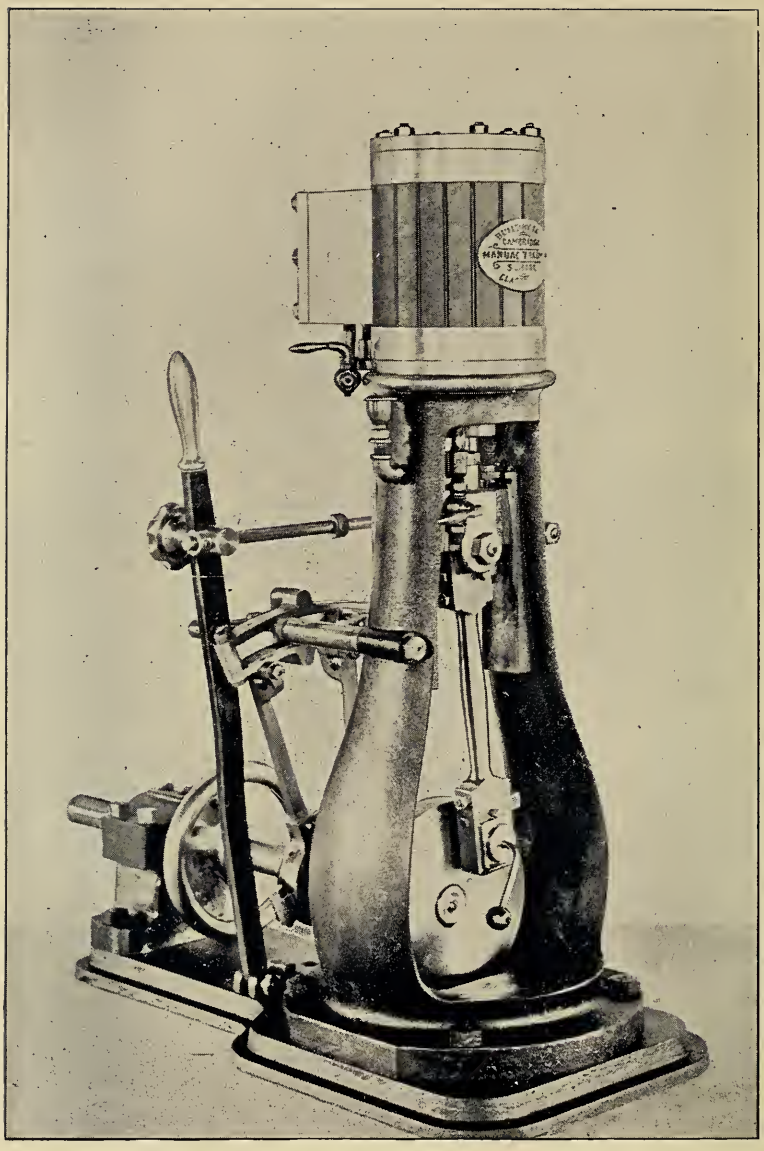

Fig. 41. — Class Exercise — Marine Engine.

sections through a building, window casings, inside and outside finish and decorations, etc., and the plans and elevations of at least two houses.

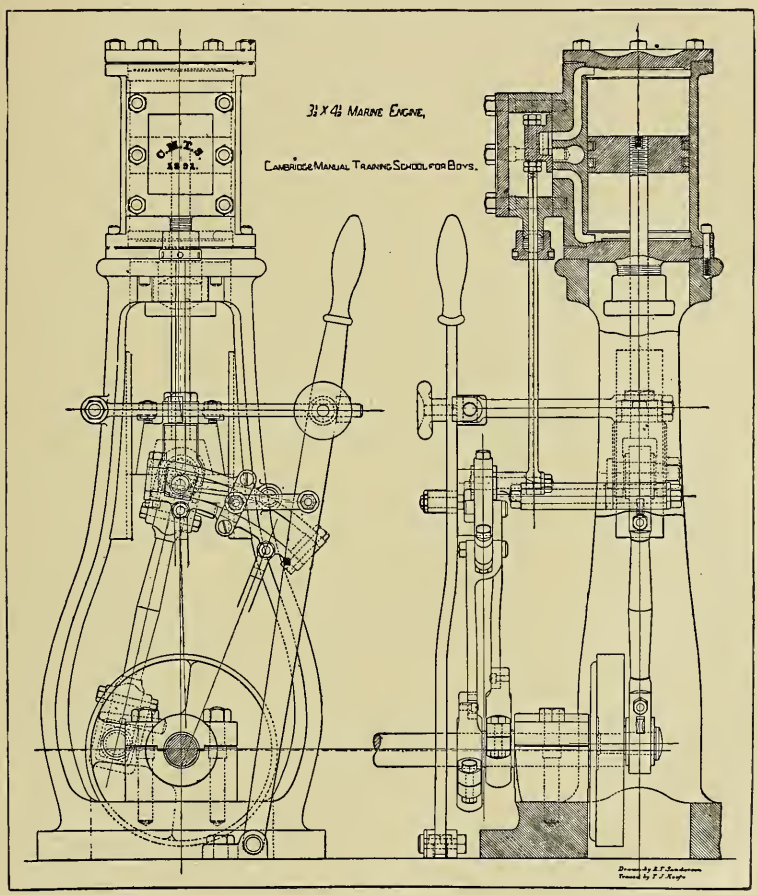


Fig. 42. — Working Drawing of Marine Engine.

For the Institute section the course is as follows: — Orthographic projections and shadows with color washes and tints, isometric projection, simple and complicated shadows, isometric intersections, etc., and descriptive geometry.

*For machine-shop work* see the paragraphs at the end of third year.

Fac-simile of the Gold Medal Diploma awarded to the Cambridge Manual Training School, October, 1895.

# DISTINCTIVE AIMS

AND

# SPECIAL FEATURES

# DISTINCTIVE AIMS OF THE SCHOOL.

In the brief sketch of the history of the school with which this circular of information began was imperfectly indicated its purpose from the point of view of its founder. In its practical organization and work, because of its correlation with the public-school system of Cambridge, while its founder's purpose has been kept constantly in view and has been given dominant force, other purposes not antagonistic to his have been considered. The distinctive educational value of manual training has been carefully studied; the relations which the school should sustain to the other educational agencies of the city have been duly considered; the prospective needs, in preparation for efficient living, of the class of boys whose interests the founder had in view and who would be likely to take advantage of its benefits have been earnestly consulted. As a result the school has come to have very definite distinctive aims and purposes of its own, which it seems desirable to state somewhat more in detail.

**Claims of Manual Training.**

Manual training, as a special form of the educational process, presents two claims to a place in any system of education looking primarily to the preparation of the individual for right living as its paramount end. These claims are, in a measure, theoretical as yet, but are fast becoming established as fact supported by the results of experience. They may be formulated as follows:

1. A properly ordered system of physical activities, exercised in the intelligent planning and production of finished products of handicraft by skilful methods, involves such exercise of the physical, intellectual, and moral activities as must necessarily result in development of physical, intellectual, and moral power.

2. The practical manual skill acquired in such a system of activities is essentially the same as is demanded by and exercised in the general productive industries in which the mass of men must exercise their energies.

Upon these claims is based a theory which is fast gaining place in the organization of school systems in the larger cities.

**Correlation of Manual Training and Other School Subjects.**

That theory is, that it is both practicable and desirable to correlate manual training with the ordinary forms of educational activity, exercised in the study of the various subjects of instruction, in such manner as to give a development more valuable for the majority of pupils than can be gotten through the single ordinary form, and of nearly or quite equal value for all pupils. Under this theory, manual training, prepared for in the form-study of the primary school, takes on the forms of compulsory sloyd work for all pupils in the grammar grade, and of carpentry, wood carving, turning, and pattern making, forging and other processes of working in iron, as elective, for boys of the high school grade. For this latter form the specially organized and more or less fully equipped manual training schools and mechanic arts schools have been established.

The two general departments of work done in these schools — the academic and the mechanical or manual — may be and are, in practice, so correlated as to be of equal educational value, and to have in view only the general educational end, a symmetrical development of all the pupil's powers. They may be, however, and in many cases are, so correlated by the larger emphasis given to the mechanical side of the work that the schools become in greater or less measure distinctively institutions for the training of their pupils for the practice of the mechanic arts in some one of their varied forms. Such are trade schools.

In accordance with the purpose of its founder, and at the same time to bring it into proper relations with the public-school system of the city, the Cambridge Manual Training School has a character peculiarly its own. It aims to give the largest practicable development of power, physical, intellectual, and moral, which can be secured from the educational forces found in an extended and well-graded course of exercises in

manual training proper; it aims to coördinate with the educational force of manual training, in fit correlation, that found in a well-balanced course of instruction in mathematics, physical science, history, civics, literature, and language; it aims to train to self-reliance, habits of obedience, and of prompt and systematic action, through the educational force of its semi-military exercises and its fire and emergency drills, and thus to give its pupils the power both to govern themselves and to control and direct the activities of others; it aims distinctively and emphatically to implant in its pupils a respect for honest labor, of whatever sort, and for the laborer as well, and thus, as far as it may legitimately, to give them a bias toward industrial pursuits; and, finally, in the mastery which it gives of the principles, the manipulations, and fundamental processes which underlie the mechanic arts, it aims to give them a long start toward making them skilful and efficient artisans. In short, it aims to make intelligent, strong-thinking, right-feeling, self-respecting, self-governing, and right-living men out of its pupils, whatever may be the position which they may be called to fill in their after life, and, at the same time, to give them a decided impulse toward the adoption of some industrial pursuit as their life work.

**Character of the Cambridge Manual Training School.**

How well or ill the school, as organized and conducted, is adapted to the securing of its distinctive aims, can be determined theoretically by testing its course of instruction, both academic and industrial, by pedagogical and psychological principles. Tested by these principles, the academical work will be seen to include a well-ordered scheme of studies adapted to the intellectual status of pupils of the high-school grade. Physical science, mathematics, language, literature, history, and civics form a group of studies whose acquisition, if they be rightly taught, brings into exercise every faculty of the intellect, and through that exercise can hardly fail of giving a strong and symmetrical intellectual development. In the right study of literature, history, and civics, moreover, is a force of highest value for the moral educa-

**The Value of the Academic Course.**

tion of the pupil. In their study he learns the best things that men have felt and thought, and finds their highest conceptions of individual and social rights and duties formulated in institutions and laws.

The industrial work in its educational force efficiently supplements and reinforces the effects of the academic. To make or read a working drawing; to see in its lines the outline of something into which crude material, whether of wood or iron, is to be wrought; to form and hold in mind the perfect image of that which is to be made; to think out and through the manipulations by which it is to be wrought; to test and prove the final result as the exact and perfect product sought from the beginning — such a process involves a series of mental activities of as wide range and as great intensity as are involved in establishing a principle in physical science or solving a problem in algebra. And the educational product of the one may be quite as great and valuable a preparation for right and efficient living as that of the other. Nor is there lacking an ethical product of large value as the effect of this process. To do things with exactness, to seek the highest perfection in the product of one's skill, even if that product be of the simplest form into which wood or iron can be wrought, is to seek the true, and may be to seek the beautiful as well. In such seeking to attain the perfect, there must be, moreover, the exercise of careful, patient persistence, which, continued through all the processes of the four years' course, can hardly fail to result in that highest of educational products — habit.

**The Intellectual Product of Manual Training.**

**The Ethical Product.**

But development and training of faculty is not the sole product of the educational process rightly ordered. Useful and usable knowledge should also be sought. Courses of study and processes of training should, therefore, be arranged and conducted with a view to giving the largest practicable results in useful and usable knowledge consistent with the largest development of faculty. Herein both the academic course of study and the

**The Practical Test.**

course in manual training will be found to conform to the aims of the school. The studies taught, and the methods of teaching outlined, are those whose results will be knowledge useful to every efficient artisan and intelligent man, and usable in the right conduct of life, in both its business and social requirements; and the manual dexterity acquired in the manipulations which enter into the processes of the mechanical work of the school, the command of implements and machinery employed, the knowledge of the nature and capabilities of the materials used, the thorough acquaintance with the methods and processes by which the best results in finished products must be attained, — all the skill and information acquired in the manual-training work, in short, — is a species of knowledge useful to, and to greater or less extent usable by, every man, and especially so to every one in any way interested or engaged in industrial pursuits.

So, too, the special and supplementary exercises of the school commend themselves as well fitted to supplement and strengthen its other educational forces, in conducing to the aims which control its work. But especially are they adapted to secure that physical health and development which are so important factors in efficient living, and to induce those habits of self-reliance, self-command, and promptness of action in emergencies, which are essential elements of strong, sturdy character.

**Effect of the Special Features.**

Theoretically, then, the work of the school closely conforms to its distinctive aims. Whether or not, in actual results, theory and practice shall be found in complete harmony, it is too soon to say. The school has been in operation for so short a time, comparatively, that those boys who are giving the results of its training the test of life among men of other training have not yet been away from it long enough to furnish conclusive evidence of the real value of their training. So far, however, as any evidence in this regard exists, it will be found in the facts disclosed regarding those who have graduated, as given in the list appended to the catalogue of pupils.

**Success of the Graduates.**

The history of the school has furnished evidence regarding two facts which are of importance. It has been found that a very considerable number of its pupils have been and are boys who would not have carried their education beyond that of the grammar school had not the manual school been accessible to them. The school, therefore, evidently furnishes a course of training demanded by actual modern conditions, and in this one respect is doing a very important work.

**Effect upon Secondary Education.**

Any educational agency which is of a character to induce boys to carry their education forward beyond the elementary stage thereby proves its right to be. Again, it has been found that as a rule those pupils who are able to do the best work in the academic course are those whose manual work is most excellent. This fact would seem to show that a real and close correlation exists between the two lines of teaching, such that each exerts an educational force supplementary to and helpful of the other; and it goes a long way to substantiate the claims upon which manual training rests its right to a place in any most efficient scheme of education.

# SPECIAL FEATURES OF THE SCHOOL.

Reference has already been made to certain exercises which may not ordinarily be considered as forming a part of the regular school work. It is the policy of the Cambridge Manual Training School not to let pass any opportunity which the school life may offer to keep boys constantly employed in those forms of right activity which may interest them and help them to make the most of themselves. To put such a purpose into practice most effectively necessitates the extension of the school authority and management beyond what is included in a course of instruction, as ordinarily understood, to embrace much that is usually left almost entirely to various voluntary organizations which are not under the control of the school authorities. In this school, although its work is enriched by many special features, there are none of these auxiliaries which are not closely connected with the general management, and they are conducted with the same earnestness and system that characterize the regular work of the school.

## THE FIRE DRILL.

The most important of these auxiliary features is the fire drill. It was originated by the late Superintendent Ellis, and, under his management, brought to its present thorough and systematic state. Introduced into the school at the outset as a voluntary element, chiefly for the sake of the physical exercise and recreation which it furnished, its greater usefulness as an educational force has been recognized in practice, so that it is now required of all boys excepting those who are physically unable to undertake it.

Every part of this drill is under the personal supervision of some instructor who has a thorough knowledge of all its details. He is held responsible for the discipline of the boys and their officers, and for the safety of all during drill. As a preliminary

Fig. 44. — The Fire-drill Room.

the pupils of the entering class are given a course of lectures explaining the use of a knowledge of fire-prevention and fire-fighting, the present methods employed, and the improvements needed. They are then given a systematic course of exercises designed to give them a practical knowledge of the methods of the fireman. Some of the exercises are the following: — Practice with the life-net; the use of the life-belt and life-harness; practice with the life-line gun; the erection and use of ladders; the handling of different forms of fire-hose, including coupling, laying the line, carrying the lines through buildings or up ladders, the use of nozzles, pipes, Siamese, goose-necks, hose-straps, spanners, etc. Practice is also given in the handling of fire-extinguishers and other forms of emergency apparatus.

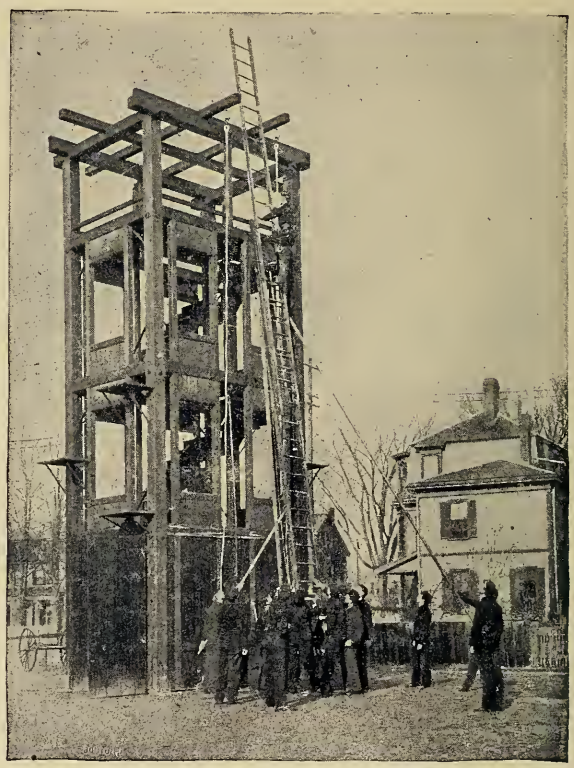

Fig. 45. — The Fire-drill Tower.

The equipment for the various forms of the drill is all that could be desired, both in variety and efficiency. There is a drill-tower (Figs. 45 and 47) forty feet high, equipped as a three-story building, with stairways, window-casings, etc. It is furnished

Fig. 46. — Fire Drill — Practice with the Life-net.

with shelves on the outside, from which jumps varying from eight to thirty feet may be made into the life-net. Overhanging timbers are arranged at the top to support heavy iron rings, to which ropes may be fastened for practice with the life-belt. Near the tower (Fig. 45) are standards for horizontal life-lines. In the basement of one of the buildings is the fire-drill room (Fig. 44), which contains a ladder truck, three hose carriages, a hand engine, with all necessary equipments, and an emergency wagon, loaded with ropes for life-lines and other articles needed for the drill. Both buildings are furnished with an electric fire-alarm system.

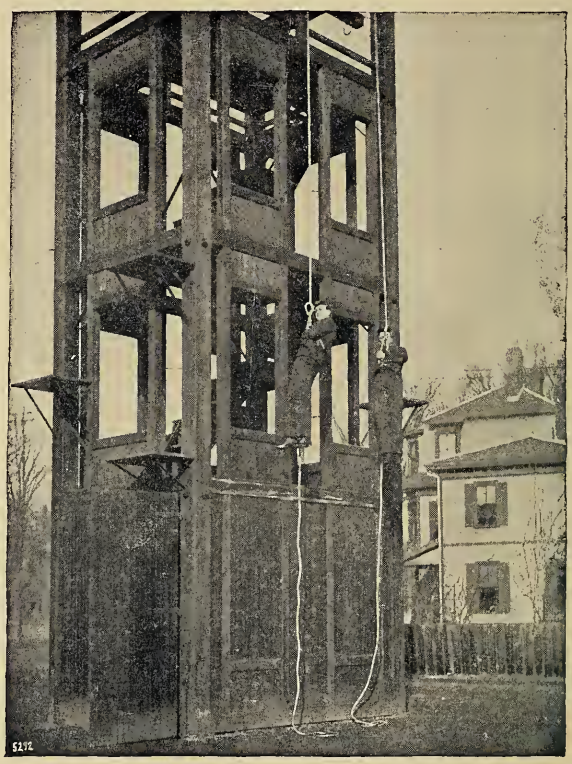

Fig. 47. — Fire Drill — Practice with the Life-belt.

For the purposes of the fire drill the entire school is organized into a battalion, divided into hose companies, ladder companies, an engine company, and an emergency corps. Besides the drill with fire apparatus, there is also a battalion drill, modelled upon the "School of the Soldier," without arms. All orders are issued in accordance with the military code.

Fig. 48. — Fire Drill — Practice with the Horizontal Life-line.

## THE BAND AND GLEE CLUB.

Two of the most instructive auxiliary features of the school are the band and the glee club.

These organizations are under the leadership of competent musical instructors, and they meet once or twice each week after school hours for lessons and rehearsals.

The band is the outcome of a drum corps which was organized in 1891 with but twelve members to furnish music in connection with the fire and military drills of the school.

In September, 1893, the drum corps was developed into a military band, which at the present time is a recognized factor in the musical circles of the state.

Among the many engagements which the band has filled may be mentioned the following: New England Chautauqua at South Framingham, races at the Charles River Park, a week with the Knights Templars in Boston, and a week with the Massachusetts Volunteer Militia at the Inauguration of President McKinley. They are engaged to go with Cambridge Commandery, Knights Templars' Conclave at Pittsburg, Pa., in the fall of 1898.

The Glee Club, although the younger organization, has also been a success from the start.

It has become popular not only in Cambridge but in the surrounding towns and cities, where its work has been of high order and enthusiastically received.

Both organizations are in constant demand for entertainments of various kinds, but only a limited number of engagements is made for them in order not to interfere with the regular school work.

The Cambridge Manual Training School Band.

## THE ATHLETIC TEAMS.

The organizations for athletics in the Cambridge Manual Training School, like other special features, are under the control of the school authorities, and are independent of other similar organizations in the Cambridge schools.

At a meeting of the Supervising Committee, held March 25, 1896, it was:

*Voted*, "That no pupil of this school shall take part in any athletic contest or game, in the name of this or any other school, without the consent of the superintendent."

The equipment for athletics is unusually ample and well chosen. Besides the shower-baths, and other appointments of the buildings already mentioned, there is a large yard which is used not only as a general playground, but as a training field for foot-ball and track athletics. It has two running-tracks, one elliptical and the other straight-away. A training-table is also maintained for the foot-ball team.

A thorough physical examination is given all candidates for the teams, and no boy is allowed to train for any athletic contest who is not in sound physical condition. The training is in charge of three competent instructors connected with the school, and every effort is made to maintain an honorable place among similar amateur associations. The aim is not only to make the team strong in physical prowess, but also to inculcate ideals of fair dealing and manly courage.

## OTHER AUXILIARIES.

Emergency lectures are given by a competent surgeon to all boys during their first year in the school. These lectures are made as practical as possible, and have already enabled several members of the school to alleviate suffering and even to save life. Morton's "Handbook of First Aid to the Injured" is the text-book used.

A school journal, "C. M. T. S. Register," of twenty pages, is published monthly during the school year. It records school items, notes of scientific interest, and contains one or more papers of a literary nature. The staff of editors is made up entirely from members of the school, and the literary matter has been furnished chiefly by voluntary contributions from the pupils.

Among the special features which remain to be mentioned is the janitor service. Applications to enter this service are made in writing at the beginning of each year. From the applicants, a dozen or more boys who are believed to be able to do the work and worthy to receive the remuneration provided for it are selected, and formed into a squad under the immediate supervision of the janitor of the school. The success of this system is universally acknowledged. Not only is the cleanliness of the rooms which results generally commended, but the indirect benefit to the boys engaged in the service is added testimony to the genius and wisdom of its originator.

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